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July 5, 2016

Mr. Ravi Sanga
EPA Remedial Project Manager
U.S. EPA Region 10
1200 Sixth Avenue, ECL 111
Seattle, Washington 98101

RE: Acid Sump Area Source Area Remedial Action Plan - Final

Dear Mr. Sanga:

ATI has revised the *Acid Sump Area Source Area Remedial Action Plan - Final* in response to EPA's comments dated June 25, 2016. Please find enclosed three (3) copies of the report.

If you have any questions, please feel free to contact me at (541) 926-4211 x. 6365.

Sincerely,

Noel Mak
NPL Program Coordinator

Enclosures: 1. Acid Sump Area Source Area Remedial Action Plan - Final

Acid Sump Area Source Area Remedial Action Plan - *Final*

ATI Facility, Albany, Oregon

July 5, 2016

Prepared by



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Acronyms and Abbreviations

µg/kg	microgram per kilogram
µg/L	microgram per liter
AC	asphaltic concrete
ASL	Applied Sciences Laboratory (contract laboratory in Corvallis, Oregon)
C	Celsius
Cis-DCE	cis-1,2-dichloroethene
CLSM	controlled low strength material
COC	chemical of concern
CWTS	central wastewater treatment system
CVOC	chlorinated volatile organic compound
DCA	1,1-dichloroethane
DCE	1,1-dichloroethene
DEQ	Oregon Department of Environmental Quality
DNAPL	dense nonaqueous-phase liquid
EPA	U.S. Environmental Protection Agency
GETS	Groundwater Extraction and Treatment System
gpm	gallons per minute
g/kg	grams per kilogram
GWTP	groundwater treatment plant
MCL	maximum contaminant level
mg/kg	milligram per kilogram
PVC	polyvinyl chloride
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
SLEP	Schmidt Lake Excavation Project
SOD	soil oxidant demand
TCA	1,1,1-trichloroethane
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
VC	vinyl chloride
VOA	volatile organic analysis

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1. Introduction

This report presents the work plan to implement additional remediation action in the Acid Sump Area of the ATI Millersburg (ATI), Albany, Oregon, facility (Site). Additional details have been added to the plan in response to U.S. Environmental Protection Agency (EPA) comments dated April 22, 2016 (*US EPA Comments Acid Sump Source Area Remedial Action Plan, Teledyne Wah Chang Superfund Site, Albany, Oregon*), and comments dated June 17, 2016 (*EPA Additional Comments, Acid Sump Source Area Remedial Action Plan, Fabrication Area, Groundwater and Sediment Operable Unit, Teledyne Wah Chang Superfund Site, Albany, Oregon*). The Acid Sump Area is located in the northwest portion of the Site as shown in Figure 1-1. The remedial investigation revealed the presence of chlorinated volatile compounds (CVOCs) in Acid Sump Area groundwater above EPA's National Primary Drinking Water maximum contaminant levels (MCL; CH2M HILL, 1993). The Record of Decision for the Site (ROD; EPA, 1994) prescribed the actions ATI needed to take to mitigate the observed CVOC concentrations. In 2002, a long-term Groundwater Extraction and Treatment System (GETS) began removing CVOCs from the Acid Sump Area through extraction well FW-3.

In September 2007, ATI intercepted a source of 1,1,1-trichloroethane (TCA) while attempting to install an additional extraction well, FW-8, in the Acid Sump Area. Previous investigations and bioremediation efforts as a result of this interception were discussed in the *Revised Acid Sump Area Source Removal and Treatment Remedial Design Work Plan* (Design Plan; GSI, 2015a). Despite dramatically reduced concentrations of CVOCs in the contaminant plume, data collected during biannual groundwater sampling suggest that a persistent source of dense nonaqueous-phase liquid (DNAPL) exists in the subsurface adjacent to the location of the attempted installation of extraction well FW-8.

To make a concerted effort to achieve the groundwater cleanup goals established in the ROD for groundwater and sediments, ATI will implement additional remediation actions in the Acid Sump Area. This report provides the details for excavating and treating CVOC-impacted soils and groundwater in the vicinity of the attempted installation of extraction well FW-8. The planned remediation actions include the application of chemical oxidants in the bottom of the source area excavation. These chemical oxidants may have a localized impact on the bioremediation efforts implemented in 2007. Additional bioremediation treatment will be implemented in the source area, if needed, as indicated by groundwater monitoring.

2. Pre-Design Investigation

The Design Plan identified several data gaps that would be filled in predesign investigations at the Site. On August 3, 2015, three investigation boreholes were advanced in the northwest, southwest, and southeast margins of the planned excavation to collect additional subsurface data (see Figure 2-1 for borehole locations). Cascade Drilling, an experienced environmental driller licensed in the State of Oregon, advanced the boreholes to refusal in the Spencer Formation using a track-mounted sonic drill rig and 6-inch-diameter drill rods. Continuous core samples were collected from each borehole to confirm

local stratigraphy, the vertical extent of the vadose zone, and the depth of the underlying Linn Gravel and Spencer Formation. Soil samples were collected for analytical determination of CVOC concentrations, assessing soil oxidant demand (SOD), and strength testing. The results of the soil studies are discussed in detail and incorporated into the excavation and soil treatment plans in the excavation and soil treatment sections of this report (Sections 4 and 5, respectively). Table 2-1, presented at the end of this report, is a summary of the data collected from the August 2015 field work. Appendix A presents the boring logs for the three investigation boreholes in addition to borehole logs for I-1, I-2, I-3, EI-5, IB-04, TMW-1, TMW-3, TMW-4, and TMW-5.

3. Remedial Action Plan

The remedial action is focused on removing the TCA source area in the Acid Sump Area through an excavation that is approximately 31 feet wide by 25 feet long by 16 feet deep. The size of the excavation is strictly constrained in all directions by the location of acid tanks, sumps, and utility corridors at the Site. The source area at attempted extraction well FW-8 and the two wells with the greatest historical concentrations of CVOCs, TMW-1 and TMW-4, are included within the excavation footprint. The excavation will be completed by Bob Barker Trucking (Barker), a construction firm with extensive environmental experience at the Site. Structural details of the excavation engineering are discussed in Section 4.

Approximately 460 cubic yards of soil will be removed from the Acid Sump Area and transported to the Schmidt Lake Excavation Project (SLEP) soil treatment pad. Soils will be mixed and treated with a chemical oxidant, activated sodium persulfate, until analytical results demonstrate that they meet the requirements for disposal in a Resource Conservation and Recovery Act (RCRA) Subtitle D landfill. GSI Water Solutions, Inc. (GSI), personnel will oversee the construction of the soil treatment pile and work closely with ATI's staff and Barker's staff to manage treatment activities within the soil treatment area. Details of the soil treatment handling and processing are presented in Section 5.

During the excavation, it is expected that CVOC-contaminated groundwater will enter the excavation. A temporary groundwater treatment plant (GWTP) consisting of excavation sumps, filter tank, air stripper, and treated water tank will be constructed to treat this groundwater. After analytical results from a batch of treated water verify the performance of the GWTP, treated water will be discharged to the Site's central wastewater treatment system (CWTS). The details of the GWTP are presented in Section 6. The general layout of the excavation area project is shown in Figure 2-1 and includes the most recent analytical data from June 10, 2015.

4. Source Area Excavation

The Design Plan selected excavation and chemical oxidant treatment as the preferred remedial action for reducing source CVOC mass in the Acid Sump Area. This combination approach includes excavation and chemical oxidation components to provide the greatest

certainty that high concentrations of CVOCs encountered in the Acid Sump Area are removed and treated. After the excavation has been completed to a total depth of approximately 15 feet, analytical soil samples will be collected to characterize CVOC concentrations in both the walls and the floor of the excavation. Next, a solid, prilled oxidizing agent will be applied to the accessible and exposed surfaces of the excavation. The in situ chemical oxidation is designed to provide some treatment for CVOCs remaining in soil and groundwater that cannot be removed from the excavation. Each of these steps is discussed in greater detail below.

The Design Plan proposed a structurally braced excavation that would remain open for several weeks to accommodate ex situ treatment of excavated soils. Treated soils then would be used to backfill the excavation. Since completion of the Design Plan, ATI personnel have decided it would be structurally beneficial to backfill the excavation with controlled low strength material (CLSM; i.e., lean concrete) and/or imported, clean fill rather than treated soils. A positive benefit of this strategy is that it will now be possible to complete the excavation in sections because it will no longer be necessary to keep the entire excavation open until all the excavated soils have met target treatment concentrations. Completing the excavation in sections instead of as a single open pit will provide a substantial reduction in risk to personnel and surrounding infrastructure. The designed excavation procedures and infrastructure protection methods are described in the following sections.

4.1 Delineation of Excavation Area

The design dimensions of the excavation are 31 by 25 feet, to a depth of about 14 to 17 feet, or more precisely, to the underlying Spencer Formation. The Design Plan identified a target excavation area of 25 by 25 feet, circumscribing existing well locations TMW-1, TMW-4, and I-1. Following discussions with EPA in July 2015, the excavation footprint was extended to 31 feet from west to east (Figure 4-1). This greater width will remove more potentially contaminated material from the source area, but also will require additional measures to protect the integrity of a below-grade acid pipe corridor located at the northeast corner of the excavation (see Figure 4-2). The excavation will remove contaminated silts and gravels to the top of an underlying siltstone formation (Spencer Formation) and will remove an estimated 460 cubic yards of potentially CVOC-impacted soils. The footprint of the excavation, however, may be modified during construction based on field conditions where structural stability or hazardous conditions are encountered. Moreover, extending the excavation based on field conditions (i.e., chasing the contamination) is not considered to be a viable option because of the limitations imposed from the existing pipelines, tanks, sumps, and other facility operations and infrastructure.

4.2 Preliminary Work

Before excavation activities commence, preliminary site work will be performed to address potentially active and inactive utilities within the excavation. Analytical samples for metals and semivolatile organic compounds will be collected from Acid Sump Area wells as part of the Site-wide monitoring that will be completed before the excavation project begins. ATI personnel will review Site drawings and utilities to positively identify active utility lines and corridors within the excavation area. An initial review of available Site drawings and

discussion with ATI personnel identified subsurface utilities: an abandoned acid sump line in the western half of the excavation, two abandoned manholes, and an active stormwater line used by the Flakeboard facility to the northeast of ATI (Figure 4-1). As part of preliminary site work, the manholes and abandoned lines will be inspected, drained, and plugged as necessary. These abandoned lines, and others that are encountered throughout the excavation, will be removed and stockpiled as construction debris. Existing groundwater monitoring wells that lie completely within the soils to be excavated (i.e., TMW-1, TMW-4, and I-1) will be abandoned by a licensed well driller in accordance Oregon Water Resources Department regulations for monitoring well abandonment.

Groundwater depths in the excavation area are anticipated to be approximately 7.5 feet below ground surface (bgs) during the summer months. To allow for saturated zone excavation, a dewatering system will be installed. One to two sumps will be installed as part of the preliminary work effort and will be installed by overdrilling existing well TMW-1 and drilling a new sump along the western boundary of the excavation (Figure 4-2). Optional installation plans were discussed with EPA during the April 7, 2016, Site visit, but those options are not going to be pursued; the sumps will be located as initially described in the February 2016 Work Plan. Sumps will be constructed using 6- to 8-inch-diameter steel casing with perforation slots cut into the bottom 5-foot sections of the casings. Drain rock, to provide and maintain hydraulic conductivity during the project, will be placed around the outside of the casings. The Spencer Formation was logged in the Site investigation borings (northwest, southeast, and southwest; Figure 4-2) at about 14 to 17 feet below the existing paved surface. The sumps will penetrate the Spencer Formation by at least 12 inches. Soils excavated during sump installations will be temporarily stockpiled in a drop box until the soil treatment pile is constructed. Additional details about sump installations are provided in Figure 4-2 while details about extracted groundwater treatment are provided in Section 6.

4.3 Protection of Existing Infrastructure

GSI has retained a foundation/geotechnical engineer, David Running, PE, GE, of Foundation Engineering, Inc., to evaluate the geotechnical conditions of the excavation area and provide recommendations for reducing the risks to adjacent infrastructure while completing the excavation. David Running has completed numerous geotechnical investigations at the ATI facility and is familiar with Site operations and health and safety requirements at the facility. GSI also has retained a structural engineer, Joe McCormick, SE, of Pillar Consulting, Inc., to provide structural analysis and design of bracing structures employed during the excavation.

Based on Site observations and available infrastructure plans, multiple temporary and permanent bracing structures likely will be used. Areas of concern were noted near the active below-grade acid sump (tank) along the northern edge of the proposed excavation: an acid pipeline conveyance corridor leading to the acid sump from the southeast and an overhead acid line with a support column located close to the northern edge of the excavation. Before excavation commences, the following bracing structures will be installed:

- The acid sump conveyance corridor on the northeast side of the excavation will be underpinned to reduce the risk of settlement. The underpinning will extend to bedrock below the bottom of the excavation. One underpinning location will be

completed at the northeastern corner of the excavation, where the excavation will undercut the conveyance corridor. The other underpinning will be completed to the south, outside of the excavation limits, to help support the structure in the event of caving of the east excavation sidewall. The approximate underpinning locations are shown in Figure 4-2. The exact locations and final trench dimensions will be finalized in the field.

- The underpinning locations will be trenched, as required, to construct a concrete grade beam beneath the acid sump conveyance corridor (perpendicular to its alignment). The grade beam may be supported on concrete piers constructed by drilling 12-inch-diameter (minimum) holes on each side of the conveyance corridor extending into the Spencer Formation and backfilling the holes with concrete. Alternatively, the underpinning may be completed by trenching perpendicular to the conveyance corridor and backfilling the trenches with CLSM.
- The overhead acid line will be supported during the excavation. A temporary beam will be installed below the north end of the existing beam that supports the acid line. The temporary beam will extend perpendicular to the pipeline and will be supported on temporary columns and footings installed east and west of the acid sump building. The approximate locations of the temporary beam and foundations are shown in Figure 4-2. Upon completion of the excavation and backfilling, the original support post will be put back into service. The temporary beam bracing will be designed by the structural engineer, who will provide ATI with necessary drawings for implementation of the structures.
- A utility pole located approximately 6 feet from the northwestern corner of the excavation may be temporarily braced using a utility pole derrick while excavating the northwestern corner, if deemed necessary by the structural engineer.
- A Flakeboard stormwater pipeline is known to pass through the excavation area with a suspected invert depth that rests atop the Spencer Formation. Actual depth of the historical stormwater line is unknown. In the event that the Flakeboard line is encountered at a shallow depth, the line will be uncovered, cut, and capped for the duration of the excavation. If the Flakeboard line is encountered atop the Spencer Formation, it will be left intact. The line will be repaired and reconnected as needed following completion of excavation activities. Before the start of excavation activities, ATI will attempt to produce a depth profile of the pipeline by sending a camera with a depth sensor down the pipeline.

The construction drawings show that the acid sump pit walls may be about 7 to 8 feet from the northern edge of the excavation and that the base of the acid sump pit lies approximately 13 feet below the paved surface (approximately 2 to 3 feet above the anticipated base of the excavation). Based on soil boring logs from the area, the acid sump pit likely bears on dense alluvial gravel underlain by shallow bedrock. Given the depth of the acid sump pit, and the horizontal distance to the excavation, there is a low risk that the excavation will undermine the foundation support for the acid sump tank. However, to reduce potential slough and increase protection to area structures, CLSM may be placed along the perimeter of the excavation to create a more effective barrier (see Section 4.4).

Although the acid sump plays a critical production role, ATI staff members indicated it may be possible to lower acid levels in the tank for 2 days. If this proves to be possible, then every effort will be made to complete perimeter excavations adjacent to the tank during that period. In all cases, excavation adjacent to the sump will be overseen by the foundation engineer, who is competent to evaluate the risk of undermining the foundation support for the tank.

As discussed in this section and below, the excavation and backfilling are to be completed in sections to maintain structural support for the infrastructure located adjacent to the sidewalls of the excavation. With this approach, the complete sidewall hydraulic bracing, described in the Design Plan, will not be required. The geophysical shoring of the acid sump conveyance corridor and the overhead acid line discussed above will be designed in consultation with the structural engineer.

4.4 Excavation Procedures

All personnel and contractors working on the project will go through ATI's awareness class for working adjacent to acids, such as hydrogen fluoride. A pre-construction meeting with ATI staff members will discuss area-specific best practices for working in the area, such as spill prevention, response, and treatment. The work exclusion zones for the excavation will be designed for the coordinated access by the department's staff to necessary valves, gauges, meters, and control devices.

Excavation equipment will access the Acid Sump Area from existing roads that enter the area from the west and the east (Figure 4-1). An equipment wash station will be positioned adjacent to the excavation area for construction equipment moving back and forth between operational areas of the project. Soil will be removed from the perimeter of the excavation first and be replaced with clean fill containing CLSM. When excavation and backfilling of the perimeter have been completed, the central portion of the excavation will be removed and backfilled in sections. The siltstone formation at the bottom of the excavation will be graded, as practical, toward the east to facilitate water transport to the sump. This may be done with a drop-tape or, more typically, by observing seepage and water flow at the bottom of the excavation to see that it is moving toward the sump.

The excavation will start in the northeast corner of the excavation to address the following concerns:

- To remove what is expected to be the highest contaminated soils first and reduce the opportunity for cross-contaminating clean fill materials.
- To provide a base depth measurement adjacent to the sump that can be used to ensure that the excavation bottom is properly sloped to the east.
- To take advantage of the inherent strength in the undisturbed soils in a sensitive portion of the excavation.
- Provide, at least initially, a safe flow of equipment and materials in one direction across the excavation.

The excavation advance during the project may vary from this plan depending on Site conditions, safe equipment operation concerns, and recommendations of the foundation engineer.

The excavation work will be completed as follows:

- Shoring will be provided for the adjacent infrastructure as described in Section 4.3.
- The existing asphaltic concrete (AC) will be saw cut along the perimeter of the excavation and the AC will be removed.
- With dewatering systems in place, the deeper excavation will begin in the northeast corner (see Figure 4-3, number 1). Soil in the perimeter of the excavation will be removed in approximately 3- to 4-foot-wide sections down to the Spencer Formation then backfilled with drain rock and CLSM (Figure 4-3). The depths to the Spencer Formation will be monitored during perimeter excavation and used to establish target depths for drainage of the interior excavation.
- Soil removal will follow the diagonal pattern shown in Figure 4-3 to provide time for the CLSM backfill to cure and harden. Soils not greatly impacted by CVOCs will be placed in the bottom of the soil treatment pile (see Section 5).
- After the perimeter of the excavation has been completed, the interior section will be removed in subsections to minimize lateral earth pressures acting on the CLSM sidewalls (Figure 4-4). The foundation engineer will be onsite to evaluate CLSM stability and provide cut slope recommendations.
- Source material and assorted debris encountered in deeper sections of the excavation will be handled in accordance with ATI's health and safety protocols and treated separately, as appropriate, in the soil treatment area. Any product encountered in the excavation will be moved into overpacks while still in the excavation area.
- The excavation will extend to the relatively impervious Spencer Formation. The surface of the rock at the bottom of the excavation will be graded to drain toward the dewatering sump in the northeastern corner of the excavation (i.e., the area with the highest historical groundwater concentrations of CVOCs).

4.5 Backfill and Compaction

- The backfill will include a sequence of drain rock, chemical oxidant, filter rock, and crushed rock or CLSM as shown in Figure 4-4 and described below. Dewatering of the drain rock will be used to reduce the impacts of the dissolved or free-flowing contaminants from upwelling into the clean fill as the excavation progresses.
- Backfill for the perimeter sections will be composed of a drain rock and subsequent CLSM. Approximately 2 feet of angular drain rock ($\frac{3}{4}$ - to 1½-inch) and 6 inches of $\frac{3}{4}$ -inch minus filter rock will be backfilled atop the Spencer Formation to allow drainage to the dewatering sumps. The remaining trench will be filled with CLSM to approximately 1 to 4 feet bgs.

- Within the interior section, a 2-foot-thick layer of drain rock (composed of $\frac{3}{4}$ - to $1\frac{1}{2}$ -inch rock) will be placed at the bottom of the excavation, above the Spencer Formation. This layer will provide a conduit for drainage toward the excavation sumps. Chemical oxidant will be applied at a rate of 2.5 pounds per square foot above the drain rock (activated sodium persulfate as part of the proprietary mixture Kloxur from PeroxyChem). The oxidant will be distributed by mechanical means, such as drop-pipes; personnel will not enter the excavation to complete this task. This corresponds to a total application in the excavation of approximately 2,000 pounds. Based on SOD and persulfate treatability studies completed using Acid Sump Area soils, a majority of the oxidant will remain as a residual to treat any contaminated groundwater flux after excavation dewatering ceases.
- A filter rock with a smaller diameter than the drain rock, a $\frac{3}{4}$ -inch minus, will be placed above the oxidant. The filter rock will provide a filter course to reduce the risk of the overlying fill penetrating into and clogging the drain rock layer.
- Clean, imported, crushed gravel or rock, meeting ATI and/or the geotechnical engineer's specifications, will be used to backfill the remainder of the excavation. The fill (designated as structural fill in Figure 4-4) will be placed in lifts and compacted using hoe-pack or other means acceptable to the geotechnical engineer to meet ATI's engineering specifications for future property use. The CLSM in the perimeter of the excavation will not require compaction.
- Following completion of the excavation, the excavation sumps will be removed and abandoned with a mixture of bentonite and concrete. The surface of the excavation will be repaved with asphalt.

The routing of construction vehicles that move soil to the soil treatment pile or bring backfill material into the excavation will be determined by field conditions, the stage of the excavation, Site stability, and expediency. Whenever practical, haul routes will be established that move in one direction past the excavation. The western entry road has sufficient width to establish two separated lanes of traffic when one-way movement through the work area is not possible.

4.6 Analytical Sampling of the Excavation

To characterize soils that will be left in place, discrete samples will be collected from the four walls and bottom of the excavation. Four discrete samples will be collected from each sidewall and the bottom (total of 20 discrete samples) in accordance with EPA Method 5035 and submitted to the CH2M HILL Applied Sciences Laboratory (ASL) in Corvallis, Oregon, for analysis.

The exact sampling locations will be determined on the basis of health and safety and structural stability concerns during the excavation. The same concerns are likely to require that the samples be collected from the bucket of the excavator or other mechanical means after removal to the surface. If this method is used, the soil samples will be taken from the interior of blocks of soil, rather than the surface, to reduce volatilization and possible contact with the bucket. An Encore™ or Terra Core™ sampler will be used to collect the sidewall and bottom samples. All samples will be field-preserved according to EPA Method 5035.

Table 4-1 outlines the analytical details to be used for the soil sampling. Samples will be transported under chain-of-custody protocol directly to ASL.

Table 4-1. Analytical Requirements for Excavation Soil Characterization Samples

ATI; Albany, Oregon

Parameter	Analytical Methods	Target Reporting Limit	Sample Container	Sample Preservation	Sample Location	Holding Time
Volatile Organic Compounds (VOCs)	EPA 5035 (sampling) EPA 8260B (VOC analysis)	0.2 mg/kg	Encore: capped Encore container Terra Core: (3) 40 mL VOA vials	Both: Cool to 4°C Terra Core: Methanol and water proportioned to sample mass	<ul style="list-style-type: none"> Each sidewall <ul style="list-style-type: none"> One: 0 to 7 feet One: 7 to 15 feet Bottom <ul style="list-style-type: none"> Two: from floor 	7 days

Notes:

EPA = U.S. Environmental Protection Agency

mL = milliliter

mg/kg = milligrams per kilogram

°C = degrees Celsius

VOA = volatile organic analysis

5. Soil Treatment

Soil excavated from the Acid Sump Area will be brought to the soil treatment area located approximately ¼ mile to the west on the SLEP soil treatment pad (see Figure 5-1). Soils, and any excavation debris entering the soil treatment area, will be managed according the soil treatment decision-making flowchart shown in Figure 5-2. The following sections provide details about the processing and management of excavated soils and debris, target treatment goals, and analytical confirmation sampling.

5.1 Soil Treatment Pile Design

The soil treatment pile will be approximately 120 by 140 feet and located in the southwest portion of the SLEP soil treatment pad. The soil treatment pile will be constructed on top of a liner of reinforced polyethylene spread over the asphalt-paved soil treatment area. The liner will provide a separation between the pavement and the pre-treatment excavation soils.

The first step in the construction of the soil treatment pile will be to place an approximately 4-inch-thick layer of relatively clean soils on top of the liner. This relatively clean soil is expected to come from the top several feet of the excavation providing that soil screening with a photoionization detector (PID) confirms the CVOC concentrations in the soil are low. Previous investigations at the Acid Sump Area showed that field PID readings below 70 ppm correlated with laboratory test results (Table 2-1) that were well below target treatment values (Table 5-1). If PID readings in the top several feet are greater than 70 ppm, the base of

the soil treatment pile will be built using clean imported fill. The 4-inch-thick layer atop the reinforced polyethylene liner will help protect the liner from tears when the soil treatment pile is turned and mixed.

Soils that do not contain free liquids will be brought directly to the soil treatment pile and spread to a maximum depth of approximately 2 feet.

5.2 Treatment of Soils with Free Liquids

Free water in the excavation will be extracted with sump pumps as detailed in Section 4. If soils with free liquids are encountered, they will be brought to the soil treatment area and placed in a 30-cubic-yard drop box located in the northern portion of the soil treatment area. When a sufficient amount of soil has accumulated in the drop box, the soil will be deposited into a rotary mixer located in the soil treatment area and mixed with dry soils until no free liquids are present. When the mixed soils are sufficiently dry they will be placed along with the other soils in the soil treatment pile. Engineering controls will be used to minimize the amount of wet or soupy excavated soils. A sump pump will be placed in the bottom of the drop box to remove visible free liquids, if present. Additional drop boxes will be brought to the soil treatment area if needed to process soils containing free liquids.

5.3 Excavation Debris Management

During the excavation, asphalt pavement, utility pipe, construction debris, and concrete may be encountered. These materials will be transported to the soil treatment area and processed in the debris area as shown in Figure 5-1.

The debris area is an approximately 30-foot by 30-foot section with a reinforced 12 mil polyethylene remediation liner at its base covered with 4 inches of clean soil fill. The clean fill will protect the integrity of the liner and retard any free liquids or products from damaging the underlying asphalt.

The excavation work is scheduled to take place in early August 2016. Historically, an average of 1 to 3 days of precipitation occurs in Albany, Oregon, in August, with less than 1 inch of total precipitation. Polyethylene sheeting (6 mil) will be kept on standby in the soil treatment area and used to cover the soil treatment pile if precipitation is forecast or seems likely to occur. In addition, precast concrete curbing will be placed along a portion of the downhill side of the soil treatment pile to limit runoff.

5.4 Selection of an Oxidizing Agent for Soil Treatment

Commonly used oxidizing agents for TCA and trichloroethene (TCE) remediation include Fenton's Reagent, permanganate, and persulfate. Fenton's Reagent, or hydrogen peroxide, catalyzed with iron under low pH was a popular remediation approach throughout the 1990s; however, because of safety concerns from off-gassing, Fenton's Reagent was ruled out as an oxidizing agent for this project. Permanganate has been shown to effectively treat organics; however, the caustic nature of permanganate and the associated precautions necessary to minimize worker exposure make it a difficult and costly product to use.

Activated persulfate is relatively easy to work with and has been shown to effectively reduce TCA and TCE concentrations in contaminated soils. GSI has successfully used granular activated persulfate in two recent full-scale soil treatment programs where its ease of application and minimal health and safety issues made it the preferred oxidizing agent for those projects. In granular form, it is nearly dust-free and may be spread with an agricultural seed or fertilizer spreader.

A soil treatability study was conducted in October-November 2015. The study used soils from the Acid Sump Area that were spiked with TCA and TCE, and demonstrated that activated persulfate is capable of reducing CVOC concentrations to below the project target treatment concentrations for soils. The treatability study is presented in Appendix B. The design concentration of persulfate required to effectively remediate the excavation soils was determined to be 2 grams for each kilogram of soil.

5.5 Soil Mixing and Addition of Activated Persulfate

When the excavation is complete and soils in the soil treatment pile have been spread evenly, activated persulfate will be spread uniformly to the top of the pile. Persulfate will be mixed into the soils using a small bulldozer or skidsteer. The blade of the bulldozer will be set at an angle to the soils and parallel to the ground surface, such that soils are turned and the activated persulfate is mixed into the soil. The blade height will be set so that the liner under the soil treatment pile is not damaged.

Alternative methods for soil mixing were considered, however, the heterogeneity of excavated soils make alternative soil mixing methods impractical. Most available mixing equipment is designed for soil or fertilizer and cannot handle the gravels and cobbles found in soils at the Site. The chemical oxidant is highly visible and if mixing appears inadequate additional passes with the bulldozer or skid steer will be made.

It is anticipated that approximately 2,100 pounds of granular activated persulfate will be required to treat the soil treatment pile, assuming an excavation volume of approximately 14,000 cubic feet and a soil density of 75 pounds per cubic foot.

5.6 Volatilization of Organic Compounds from the Soil Treatment Pile

Volatilization of CVOCs from the soil treatment processes will comply with emission limits and reporting requirements for ATI's Title V Air Permit (Permit No. 22-0547-TV-01), which limits the allowable discharge of CVOCs to 18 tons. ATI's permit requires a 30-day notification for minor emissions modification. This notification will be completed at least 30 days before beginning remediation activities.

Soil samples were collected from the acid sump at various depths in August 2015 and analyzed for concentrations of CVOCs. Table 2-1 presents the analytical results of the sampling that was used to estimate the total amount of CVOCs that may volatilize during soil treatment operations.

The detected values of all CVOCs were added together and multiplied by a safety factor of 2.5 to estimate the average CVOC concentration in the excavation soils: 10 milligrams per

kilogram (mg/kg). Assuming all CVOCs will volatilize, and that the mass the soil treatment pile is expected to be about 1.1 million pounds, the total theoretical volatilized mass will be about 11 pounds. A more accurate assessment of the volatilization for Title V reporting requirements will be completed during the course of the project using actual analytical results. It is not likely the discharges will exceed the emission limits of the permit.

5.7 Target Treatment Concentrations for Excavated Soils

Soil treatment and mixing will continue until analytical results confirm that target treatment concentrations of CVOCs have fallen below Oregon Department of Environmental Quality's (DEQ) risk-based concentrations for the soil ingestion, dermal contact, and inhalation exposure pathway for occupational receptors. Treated soils will meet DEQ's risk-based concentrations, or meet the treatment standards for soil found in the *Code of Federal Regulations* (40 CFR 268.49). Risk-based target treatment concentrations for excavated soils are shown in Table 5-1. ATI plans to send treated soils to a RCRA Subtitle D landfill.

Table 5-1. Target Treatment Concentrations for Excavated Soils
ATI; Albany, Oregon

Parameter	DEQ Risk-Based Concentration (ppm)
TCA	870,000
DCA	260
Trichloroethene (TCE)	51
DCE	29,000
cis-DCE	2,300
Vinyl chloride	4.4

Notes:

Based on soil ingestion, dermal contact, and inhalation for occupational receptors.

ppm = parts per million

DEQ = Oregon Department of Environmental Quality

5.8 Sample Collection

Approximately 1 week after activated persulfate has been mixed into the soil treatment pile, 12 discrete samples will be collected. Three samples will be collected from each quadrant of the soil treatment pile, as shown in Figure 5-1. If the target treatment concentrations are not met, additional confirmation samples will be collected after additional treatment is completed. This process will be repeated until target treatment concentrations are met.

Soil treatment pile samples will be collected using Encore™ or Terra Core™ samplers according to EPA Method 5035. The sampler will be pushed into a freshly exposed portion of the soil until it is completely filled with soil. Each sample will be placed immediately into an iced cooler. Discrete sample test results will be compared to target treatment concentrations presented in Table 5-1.

Samples will be transported under chain-of-custody protocol directly to ASL for analysis. These details are summarized in Table 5-2.

Table 5-2. Analytical Requirements for Treated Soils
ATI; Albany, Oregon

Parameter	Analytical Method	Target Reporting Limit	Sample Container	Sample Preservation	Sample Location	Holding Time
Volatile Organic Compounds	EPA 5035 (sampling) EPA 8260B (VOC analysis)	0.2 mg/kg	Encore: capped Encore container Terra Core: (3) 40 ml VOA vials	Both: Cool to 4°C Terra Core: Methanol and water proportioned to sample mass	3 discreet locations for each quadrant (Figure 5-1)	7 days

Notes:

EPA = U.S. Environmental Protection Agency

mg/kg = milligrams per kilogram

°C = degrees Celsius

VOA = volatile organic analysis

Clean dedicated sampling equipment will be used to collect all soil treatment samples. Appropriate decontamination practices will be used on all non-disposable sampling equipment. Decontamination procedures to be followed by all personnel will include the following steps:

1. Remove loose soil using appropriate tools.
2. Rinse and scrub equipment in tap water until all visible dirt has been removed.
3. Soak and scrub equipment in Liquinox solution.
4. Rinse equipment with tap water to remove soap.
5. Rinse equipment with deionized water.
6. Allow equipment to air dry.
7. Wrap and cover equipment in aluminum foil until next use.

Quality assurance (QA) samples will be collected at the soil treatment pile. Field duplicate soil samples will be collected to provide data on the precision of sampling efforts and laboratory analysis. A field duplicate will be collected for each round of sampling that takes place. If non-dedicated sampling equipment is used to collect an analytical sample, a rinsate blank will be collected on that piece of equipment.

Analytical reports from ASL will be submitted with a case narrative, a copy of the chain-of-custody form, and a cover letter that summarizes any QA or other analytical issues that were detected. Electronic deliverables will be requested for each sampling event. Data will be provided in a normalized flat file format.

6. Excavation Groundwater Treatment

Groundwater extracted from the excavation area will be treated by the GWTP. The GWTP will filter and store groundwater from the excavation and remove CVOCs by employing a high-efficiency air stripper. Dewatering and treatment will begin approximately 2 weeks before the main excavation commences through the dewatering sumps described in Section 4. Groundwater extraction and treatment will continue at least until the excavation is backfilled above the static groundwater table.

Design details and calculations for the GWTP are presented in the following sections and in the attached figures, tables, and equipment specifications. Conservative assumptions were used for dewatering pumping rates, influent CVOc concentrations, treatment efficiency rates, and groundwater storage capacity to provide a level of flexibility and safety during dewatering and treatment operations. Verification testing of treated groundwater from the GWTP will take place initially to confirm that the treatment system is attaining CVOc target treatment concentrations before discharging treated water to the Site's CWTS.

6.1 Determination of Design Influent Concentrations

As with the soils removed during the excavation, TCA and its associated daughter products are the primary chemicals of concern (COC) in the excavation groundwater; concentrations of TCA as high as 730,000 micrograms per liter ($\mu\text{g/L}$) and concentrations of TCA breakdown products as high as 120,000 $\mu\text{g/L}$ have been detected in groundwater samples collected from wells near the excavation area. Concentrations of TCE as high as 4,000 $\mu\text{g/L}$ and TCE breakdown products as high as 60,000 $\mu\text{g/L}$ have been detected in groundwater extracted from the excavation area. Although these elevated concentrations are not likely to represent the typical or average CVOc concentrations that will be encountered during dewatering activities, the GWTP was designed to effectively treat these concentration levels before discharging into the Site's CWTS.

The data used to estimate concentrations of CVOcs that may be encountered in extracted groundwater are presented in Table 6-1 (located at the end of this report). Concentrations of CVOcs recorded in temporary monitoring wells TMW-1, TMW-3, TMW-4, and TMW-5 from 2012 through 2015 were used to determine the design influent concentrations to the GWTP (GSI, 2015b). Specifically, concentrations of CVOcs from the four wells were averaged to determine a design influent concentration. It was assumed that because these wells are located adjacent to the known source area (at attempted extraction well FW-8) that overall groundwater concentrations from the excavation are likely to be lower. Thus, these design influent concentrations provide a conservatively high estimate of CVOc concentrations that may need to be treated by the GWTP.

6.2 Design Treatment Concentrations

Target treatment concentrations for the GWTP are presented in Table 6-2 along with the design influent concentrations. Treated groundwater from the GWTP will be discharged into a nearby drain in the Acid Sump Area that leads to the CWTS. The target treatment

concentrations selected for the system are the MCLs for organic chemicals from the Table of Regulated Drinking Water Contaminants (EPA, 2010).

Table 6-2. Excavation Area CVOCs and Target Treatment Concentrations

ATI; Albany, Oregon

Chemical of Concern	Design Influent Concentration Requiring Treatment ¹ (µg/L)	Target Treatment Concentration in GWTP Effluent – MCLs ² (µg/L)
1,1,1- TCA	280,000	200
1,1-DCA	36,000	50 ³
1,2-DCA	1,000	5
Chloroethane	13,000	25 ³
Trichloroethene (TCE)	2,000	5
cis-1,2-DCE	1,000	70
trans-1,2-DCE	1,000	100
1,1-DCE	20,000	7
Vinyl Chloride	1,000	2
Tetrachloroethylene (PCE)	1,000	5

Notes:

¹See Table 6-1 for influent concentration calculations.

²MCL = maximum contaminant level values from the U.S Environmental Protection Agency (EPA) Table of Regulated Drinking Water Contaminants

³No MCL for this compound

GWTP = groundwater treatment plant

CVOC = chlorinated volatile organic compound

µg/L = microgram per liter

6.3 Groundwater Infiltration Rates and GWTP Components

Individual components of the GWTP have been sized to handle the groundwater extraction rates anticipated during the dewatering operations. The GWTP has been designed to handle incoming flows and effectively reduce influent CVOC concentrations to levels below the target treatment standards (i.e., MCLs). Excess capacity and operational capability have been included in the design to accommodate the processing of water volumes or influent concentration levels that exceed the conservative design estimates.

The estimated groundwater infiltration rate was calculated and used to size the pumps and components of the GWTP. Darcy's equation was applied while treating the excavation as a single large well or sink in an unconfined aquifer. Hydraulic conductivity for the equation was determined using previous investigations in the Fabrication Area at the ATI facility during the construction and implementation of the GETS (CH2M HILL, 2005). A range of radius of influence to drawdown values then was examined to estimate a range of potential infiltration rates into the excavation. Figure 6-1 presents the rationale and calculations used to establish a conservative steady state infiltration rate of 15 gallons per minute (gpm). In addition to being selected from the high range of potential infiltration rates, 15 gpm is conservative because it is based on the entire excavation being open at once instead of in smaller segments that are backfilled before moving to other sections, as described in Section 4.

Using the design influent CVOC concentrations and groundwater infiltration rates, individual treatment components were selected that will effectively handle and treat the predicted concentrations and water volumes. Figure 6-2 presents the design details of the

GWTP and the locations of the individual treatment components at the Site. Sump pumps will remove water from the excavation and discharge it into a filter tank. A pump at the filter tank discharge will drive water through an air stripper and into a treated water tank. From there the treated water will be directed through a nearby chemical drain leading to the Site's CWTs. Details of these components of the GWTS are presented below.

Sump and transfer pumps for the GWTP are sized to handle designed flows and take into account expected losses through elevation changes in the system and the flow resistance of treatment system components, which include piping and associated hardware (e.g., valves, flow meters, manifolds, etc.). Sump pumps used to dewater the excavation will be provided by Barker. Semi-transparent braided polyvinyl chloride (PVC) tubing will be used to transport water between system components to minimize pinching and kinking of the lines during pumping operations and to provide a capability to visually inspect water movement through the lines. Connections in the tubing will be made with quick-connect, or Camlock™ fittings to allow quick adjustment to the changing footprint of excavation operations and provide for continued uninterrupted production activities at the facility.

Solids suspended in groundwater have the potential to foul bubble plates mounted between the air stripper trays, which can lead to reduced treatment efficiency. To prevent fouling of the air stripper, water extracted from the excavation first will be pumped into a filter tank; the 20,000- gallon BakerCorp Open Top Tank, shown in Figure 6-2. Solids present in the groundwater will filter out of solution in three internal chambers separated by fabric weirs with 150-micron mesh screens. Design specifications for the BakerCorp tank are provided in Appendix C along with a photo of the fabric weirs. In addition to serving as a filtration tank, the 20,000-gallon filter tank provides a water storage capability that can be used to accommodate greater than expected dewatering volumes or additional reserve capacity should downstream treatment components need to be shut down or require maintenance. The extra design capacity of the filter tank will provide the ability to continue dewatering and filtering water from the excavation during the night if that is considered necessary or beneficial to the safe and timely completion of the project.

A Geotech LO-PRO III air stripper will be used to treat concentrations of CVOCs to below target treatment concentrations (i.e., MCLs). The LO-PRO III is designed to process flows of 1 to 60 gpm, which are well above the anticipated infiltration and dewatering rates. Technical personnel at Geotech Environmental calculated CVOC removal efficiencies for the LO-PRO III using the design influent concentrations for the excavation and a flow rate of 30 gpm through the air stripper. The calculations show that CVOC concentrations will be reduced to levels below target treatment concentrations after a single pass through the air stripper with the possible exception of 1,1,1-TCA if the concentrations equal or exceed the conservatively high design influent concentrations. In the event that verification sampling shows that one or more CVOCs is not reduced below the MCL, either additional passes will be made through the air stripper or a second air stripper will be brought online. Design specifications for the LO-PRO III air stripper and the associated removal efficiency calculations for the project COCs are presented in Appendix C.

Water pumped through the air stripper then will be pumped to a 6,500-gallon polyethylene treated water tank for use in confirmation sampling for target treatment concentrations during project startup operations. After target treatment concentrations have been

confirmed water will be discharged to a chemical drain and the Site's CWTS. In addition to serving as a sampling station for treated effluent, the treated water tank will provide additional water storage capacity for the project. Specifications for the treated water tank are provided in Appendix C.

6.4 GWTP Setup and Operation

The GWTP will be assembled before the operation of the dewatering sumps. The filter tank, air stripper, and treated water tank will be scheduled to arrive onsite at least 2 weeks before the excavation work. Figure 6-2 shows the locations for different system components at the Site and the routing of the piping/tubing to convey untreated and treated groundwater. The filter and treated water tanks and air stripper will be set up to the west of the Acid Sump Area excavation, to be away from construction equipment and operations. Treated water will be routed away from excavation activities to a chemical drain that leads to the Site's CWTS.

Concurrent with the setup of the GWTP, two dewatering sumps will be installed at opposite ends of the excavation area 2 weeks before full-scale excavation activities begin, as described in Section 4. As soon as the GWTP is assembled and the dewatering sumps are installed, the sump pumps will be turned on to begin filling the filter tank. Initial dewatering rates will be assessed and compared to designed rates to refine subsequent extraction rates from the excavation. During the first week of operation, before excavation activities, the GWTP will extract only 6,000 gallons to assess the efficiency of its components. After sufficient treatment has been confirmed, the GWTP will be dewatering on a continuous basis.

Design calculations indicate that one pass through the air stripper will bring treated groundwater below the target treatment concentrations for CVOCs, with the possible exception of 1,1,1-TCA. To confirm the calculations and performance of the air stripper, treated water samples will be collected during the GWTP startup. Collocated samples will be collected of the pre-treated and post-treated water from sample ports positioned downstream of the filter tank and treated water tank (see Figure 6-3). One sample pair (untreated and treated water) will be tested with an AQR Color-Tec field test kit for CVOCs while the other sample pair will be sent to ASL for EPA 8260B analysis of CVOC concentrations. The field test kit has been widely used to help characterize CVOC concentrations at many remediation sites for many years (EPA, 2004). When paired with site-specific analytical data, it provides an accurate total CVOC assessment from approximately 5 µg/L up to 1 million µg/L.

The sequence of initial confirmation sampling will consist of the following steps:

- After approximately 6,000 gallons have been pumped from the excavation into the 20,000-gallon filter tank (week 1), two collocated water samples will be collected from the filter tank discharge sample port to determine the influent concentration of total CVOCs.
- One sample will be analyzed with a field test kit and the other sample will be submitted to ASL.

- After the initial untreated water sample has been collected, approximately 5,000 gallons of water from the filter tank will be pumped through the air stripper and into the 6,500-gallon treated water tank. A second set of collocated samples will be collected from the discharge sample port at the treated water tank and analyzed by both the field test kit and ASL to determine the treated effluent concentration of CVOCs.
- Water in the treated water tank will be held until confirmation sampling confirms that the GWTP is producing treated water suitable for discharge into the Site's CWTS.

Results from the analytical sampling will be used to determine if additional treatment strategies need to be implemented. Water may be recirculated back through the filter tank for an additional pass through the air stripper or additional air stripper(s) may be added to the treatment train. After the field test kit has been calibrated to laboratory analytical results, it will be used to confirm that the influent concentration of CVOCs lies within the range of values that can be effectively treated by the air stripper. The engineering goal of the treatment system is to provide a safe, continuous discharge of water meeting target treatment concentrations to the CWTS while continuing to accept input flows from the excavation, if required.

If dewatering rates are much lower than anticipated (e.g., 1 gpm), several days may be required to extract the initial 6,000 gallons; thus sufficient time must be allowed for initial testing of the treated water before the excavation begins. After treatment cycle samples have been collected, the GWTP and sump pumps will be shut down. After the analytical results confirm that the target treatment concentrations shown in Table 6-2 have been attained, and the number of treatment cycles required to attain them, dewatering of the excavation area will commence by restarting the sump pumps and filtering water for subsequent treatment in the air stripper.

Figure 6-3 presents the flow schematics and operations of the GWTP during the daytime and nighttime work shifts. During the daytime, as much water as practical will be processed through the air stripper and discharged to the Site's CWTS. The influent and effluent CVOC concentrations will be monitored so that treated water may be discharged directly from the air stripper(s) to the CWTS without passing through the treated water tank. An effort will be made to monitor and make as much room as possible available in the filter tank to accommodate any required increase in dewatering rates during the excavation. In short, the plumbing infrastructure has been designed to provide maximum flexibility to move, filter, treat, recycle, and discharge groundwater, as required under unanticipated conditions.

At night, for health and safety reasons, the air stripper and system components downstream of the filter tank will not be operated unless a dedicated operator is provided to monitor the equipment. However, dewatering of the excavation into the filter tank through the sump pumps may need to continue at night at controlled rates to ensure that the water level in the excavation does not recover. Recirculation of water in the filter tank may be conducted for additional filtering and passive stripping. Continuous operation of the GWTP may need to occur during nighttime hours if water storage capacity is depleted. However, no water will be discharged to the Site's CWTS during nighttime hours without the supervision of a

dedicated operator. No equipment will be left in an operational state without the coordination, inspection, and monitoring of ATI personnel.

After the excavation is backfilled above the static groundwater table, the GWTP may be shut down and disassembled. Solids that have accumulated in the filter tank will be removed and transported to the soil treatment area for processing, as described in Section 5. Rental tanks and equipment will be decontaminated as required by the tank vendors.

6.5 Sample Collection

To determine the efficiency of the GWTP and ensure that target treatment concentrations are being achieved before discharge to the Site's CWTS, groundwater samples will be collected and tested for concentrations of CVOCs. A dedicated sampling port will be installed downstream of the filter tank and downstream of the treated water tank for collecting groundwater samples for both untreated and treated water. The sampling ports will be opened slightly during pumping to divert groundwater through the sample collection port and into the sampling containers. The ports will be covered during routine operations to keep them free from contamination and will be cleaned and rinsed with Liquinox and deionized water before collecting a sample.

The groundwater will be analyzed for CVOCs (TCA, TCE, and their daughter products) by EPA Method 8260B. Table 6-3 outlines the analytical details for the groundwater samples that will be transported under chain-of-custody protocol directly to ASL with an expedited turnaround time to avoid delays in the processing and discharge of groundwater.

Table 6-3. Analytical Requirements for Untreated and Treated Groundwater Samples
ATI; Albany, Oregon

Parameter	Analytical Method	Target Reporting Limit	Sample Container	Sample Preservation	Sample Location	Holding Time
Volatile Organic Compounds	EPA Method 8260B	0.5 µg/L	3 40-mL glass, Teflon-lined septum	HCL pH < 2, Cool to 4°C	<i>Influent</i> - sample port before air stripper <i>Effluent</i> - sample port after treated water tank	14 days

Notes:

EPA = U.S. Environmental Protection Agency

HCL = hydrochloric acid

µg/L = microgram per liter

mL = milliliter

°C = degrees Celsius

Sample collection for the collocated AQR Color-Tec sampling is similar to standard groundwater sampling for CVOCs; a new dedicated 40-ml VOA vial is filled for analysis at the same time vials for the laboratory are being filled. Because the samples are analyzed right after collection, they are not preserved or iced. The analysis process is similar to that

used for Draeger Tubes, which have long been the health and safety standard for the detection and analysis of hazardous chemicals. A piston pump is used create a vacuum and draw CVOCs from the sample vial through a dedicated extraction needle. The purged CVOCs are drawn through colorimetric tubes, which employ an oxidizer (PbO₂) and catalyst (H₂SO₄) to produce hydrogen chloride that then discolors a reagent in the tube. Dedicated and disposable equipment is provided for the analyses by the field test kit vendor including vials, extraction needles, carbon filters, and test tubes.

6.6 Estimated Mass of CVOCs Removed during Groundwater Treatment

The quantity of CVOCs that could be emitted during groundwater treatment was determined by multiplying the design extraction rate of 15 gpm by the design influent concentrations shown in Appendix C and a dewatering period lasting 15 days (1 week of pre-excavation dewatering + 8 days of excavation dewatering) plus the additional 6,000 gallons extracted during the GWTP startup. Table 6-4 shows that the excavation project could emit up to 980 pounds of CVOCs during the dewatering and treatment operations. As discussed in Section 6.1, the dewatering rates and influent concentration estimates were conservatively biased high and this is reflected in the estimate of 980 pounds.

Table 6-4. Estimated CVOC Removal during Groundwater Treatment Operations
ATI; Albany, Oregon

Chemical of Concern	Design Influent Concentration (µg/L)	Design Dewatering Rate (gpm)	Length of Dewatering Period ¹ (d)	Mass of CVOC Removed (kg)	Mass of CVOC Removed (lb)
1,1,1- TCA	280,000	15	15	350	771
1,1-DCA	36,000			45.0	99.1
1,2-DCA	1,000			1.25	2.75
Chloroethane	13,000			16.2	35.8
Trichloroethene (TCE)	2,000			2.50	5.51
cis-1,2-DCE	1,000			1.25	2.75
trans-1,2-DCE	1,000			1.25	2.75
1,1-DCE	20,000			25.0	55.1
Vinyl Chloride	1,000			1.25	2.75
Tetrachloroethylene (PCE)	1,000			1.25	2.75
Total CVOCs Removed from GWTP				445	980

Notes:

1. Dewatering period also includes 6,000 gallons extracted during week 1 of the GWTP startup to monitor removal efficiencies.

CVOC = chlorinated volatile organic compound

µg/L = microgram per liter

gpm = gallons per minute

d = day

kg = kilogram

lb = pound

GWTP = groundwater treatment plant

As noted in Section 5.6, ATI operates in compliance with emission limits and reporting requirements described in ATI's Title V Air Permit (Permit No. 22-0547-TV-01), which limits the allowable discharge of CVOCs to 18 tons. ATI's permit requires a 30-day notification for minor emissions modification. This notification for emissions from the excavated soil and

extracted groundwater will be completed at least 30 days before beginning remediation activities.

7. Schedule

A conceptual project schedule is presented in Figure 7-1, which was submitted with the Design Plan. The predesign study components were completed in 2015 and are discussed in Section 2.

This report has gone through preliminary technical and process review by ATI's staff and engineers. The Remedial Action Plan was submitted to EPA in February 2016, ahead of the schedule provided in Figure 7-1 (4-15-2016), to allow ample time for discussion and review before the scheduled EPA Site visit on April 7, 2016. Comments and revisions from the Site visit and discussions with EPA have been incorporated into this final work plan to be submitted no later than June 15, 2016. The excavation project is targeted to take place in the late summer of 2016 with a final remedial action report to be submitted to EPA in late 2016.

8. Reporting

Three documents will be submitted to EPA as part of the source area soil removal project:

- **Remedial Design Work Plan.** Submitted to EPA on April 27, 2015, and revised after comments from EPA to ATI in a letter dated June 19, 2015, and discussions in Seattle, Washington, with EPA on July 7, 2015. The revised plan was submitted to EPA on July 10, 2015.
- **Remedial Action Plan.** This document, which is a detailed work plan for implementing the remedy.
- **Remedial Action Report.** Final report documenting remedial actions.

9. Performance Monitoring

Subsequent evaluation of the performance impacts of the remediation will be documented in future annual Fabrication Area Groundwater Remedial Action Progress Reports. ATI will include adjacent monitoring wells EI-5, I-2, and I-3 to the semiannual Acid Sump Area groundwater monitoring program to replace wells removed during the excavation. Construction logs for these added wells—showing well depth, screened interval and stratigraphy—are included in Appendix A.

Evaluation of the impact on groundwater in the source area will be presented in future annual Fabrication Area Groundwater Remedial Action Progress Reports. In addition, evaluation of the ongoing performance of the bioremediation treatment, implemented in 2009, will continue with consideration given to the potential impact from chemical oxidants applied in the source area excavation.

10. References

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GSI. 2015b. Fabrication Area Groundwater Year 2014 Remedial Action Progress Report. October 15, 2015. Prepared by GSI Water Solutions, Inc. (GSI).

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Tables

Table 2-1. Predesign Investigation Results Summary - August 2015

ATI Wah Chang; Albany, Oregon

Sample Data			Stratigraphy				Analytical Data								Soil Strength
Borehole ID	Depth (ft. bgs)	PID Reading* (ppm)	Vadose Depth (ft. bgs)	Linn Gravel Depth (ft. bgs)	Spencer Formation (ft. bgs)	DTW (ft. bgs)	TCA (µg/kg)	DCA (µg/kg)	TCE (µg/kg)	DCE (µg/kg)	cis-DCE (µg/kg)	VC (µg/kg)	SOD (g/kg)	SPT Counts (5-10-15 ft)	
NW	0-8	0.00	0-11	8-14	14	11	470	12	ND	ND	ND	ND		5-8-5	
	8-11	68					1,600	190	ND	320	ND	ND		10-15-17	
	11-14	74					26,000	ND	ND	ND	ND	ND	2.18	50-50-2 inches	
SW	0-7.5	0.00	0-10	10-16	16	12	540	9.8	ND	ND	ND	ND		2-2-5	
	7.5-10	0.00					46	ND	ND	ND	ND	ND		21-18-21	
	14-16	14.4					21	5.5	ND	ND	ND	ND	1.88	50-5 inches	
SE	0-5	0.00	0-5.5	12-15.5	15.5	5.5	10	ND	ND	ND	ND	ND		loose	
	9-12	54					730	31	6.6	ND	ND	ND		8-13-22	
	12-15.5	10.1					100	3.6	ND	ND	ND	ND	2.12	2-5-11	

Notes:

*** Highest recorded PID measurement within sample interval**

NW = northwest borehole. See Figure 2 for locations of predesign boreholes.

SW = southwest

SE = southeast

DTW = approximate depth to saturated soils in borehole

TCA = trichloroethane

DCA = 1,1-dichloroethane

TCE = trichloroethene

DCE = 1,1-dichloroethene

cis-DCE = cis-dichloroethene

VC = vinyl chloride

SOD = soil oxidant demand

SPT = standard penetration test; number of hammer blows required to penetrate 6, 12, and 18 inches below station

ft. = feet

bgs. = below ground surface

µg/kg = micrograms per kilogram

g/kg = grams per kilogram

ND = not detected compound

Table 6-1. Average CVOC Concentrations in Excavation Area Wells - 2012 to 2015
ATI Wah Chang; Albany, Oregon

Analyte	Units	TMW-1							TMW-3						
		6/12	12/12	5/13	12/13	7/14	2/15	Avg TMW-1 CVOC Conc. 2012-2015	6/12	12/12	5/13	12/13	7/14	2/15	Avg TMW-3 CVOC Conc. 2012-2015
CVOCs															
1,1,1- TCA	µg/L	712	52	48	548	673,000	190	112,425	492,000 E	384,000 E	365,000	422,000	460,000 E	329,000	408,667
1,1-DCA	µg/L	4,030	975	928	3,990	60,000	463	11,731	25,300	20,500	19,350	25,000	30,600	27,100	24,642
1,2-DCA	µg/L	14.4 J	14	11.2	11 J	10,000 U	12.8	844	200 U	500 U	500 U	1000 U	1,000 U	10,000 U	1,100
Chloroethane	µg/L	13,000 E	8,070 E	8,150	13,500	10,000 U	9,800 E	9,587	11,600	9,250	8,750	9,310	13,900	18,700	11,918
Trichloroethene	µg/L	44.3	7.44 J	5.31 J	10.7	10,000 U	10 U	845	1330	1050	980	1290	1,190	10,000 U	1,807
cis-1,2-DCE	µg/L	13.1 J	8.29 J	7.99 J	25 U	10,000 U	10 U	841	200 U	500 U	500 U	1,000 U	1,000 U	10,000 U	1,100
trans-1,2-DCE	µg/L	10 U	10 U	10 U	25 U	10,000 U	10 U	839	200 U	500 U	500 U	1,000 U	1,000 U	10,000 U	1,100
1,1-DCE	µg/L	906	204	212	305	62,400	53.8	10,680	20,700	16,700	14,300	23,500	20,800	21,500	19,583
Vinyl Chloride	µg/L	1,370	764	703	128	10,000 U	142	1,351	646	454 J	423 J	508 J	1,000 U	10,000 U	1,255
Tetrachloroethylene	µg/L	37.1	18.3	15.6	25 U	10,000 U	4.6 J	848	200 U	500 U	500 U	1,000 U	1,000 U	10,000 U	1,100

Analyte	Units	TMW-4							TMW-5							Average CVOC Conc. in TMW-1, TMW-3, TMW-4, & TMW-5 2012-2015		
		6/12	12/12	5/13	12/13	7/14	2/15	Avg TMW-4 CVOC Conc. 2012-2015	6/12	12/12	5/13	12/13	7/14	2/15	Avg TMW-5 CVOC Conc. 2012-2015	Analyte	Avg Conc	
CVOCs																		
1,1,1- TCA	µg/L	537,000 E	506,000 E	495,000	595,000	731,000	725,000	598,167	149	73.4	66.9	197	500 U	500 U	164	1,1,1- TCA	279,856	
1,1-DCA	µg/L	87,300	149,000	123,000	63,100	121,000	109,000	108,733	383	281	253	611	979	500 U	460	1,1-DCA	36,391	
1,2-DCA	µg/L	400 U	1,000 U	1,000 U	1,000 U	5,000 U	10,000 U	1,533	10 U	25 U	25 U	25 U	500 U	500 U	90	1,2-DCA	892	
Chloroethane	µg/L	2,760	4,380	4,150	1,410	2,800 J	10,000 U	3,417	9,320 E	116,000 E	10,800	12,100	14,200	4,830	27,875	Chloroethane	13,199	
Trichloroethene	µg/L	2590	2,250	1,960	2,470	3,820 J	10,000 U	3,015	10 U	25 U	25 U	25 U	500 U	500 U	90	Trichloroethene	1,439	
cis-1,2-DCE	µg/L	400 U	1,000 U	1,000 U	1,000 U	5,000 U	10,000 U	1,533	10 U	25 U	25 U	25 U	500 U	500 U	90	cis-1,2-DCE	891	
trans-1,2-DCE	µg/L	400 U	1,000 U	1,000 U	1,000 U	5,000 U	10,000 U	1,533	10 U	25 U	25 U	25 U	500 U	500 U	90	trans-1,2-DCE	891	
1,1-DCE	µg/L	57,400	38,200	37,600	55,700	53,100	59,800	50,300	51.1	40	38.1	255 J	388 J	500 U	170	1,1-DCE	20,183	
Vinyl Chloride	µg/L	400 U	1,000 U	1,000 U	1,000 U	5,000 U	10,000 U	1,533	50.1	61.5	58.1	82.8	500 U	500 U	125	Vinyl Chloride	1,066	
Tetrachloroethylene	µg/L	400 U	1,000 U	1,000 U	1,000 U	5,000 U	10,000 U	1,533	10 U	25 U	25 U	25 U	500 U	500 U	90	Tetrachloroethylene	893	

Notes:

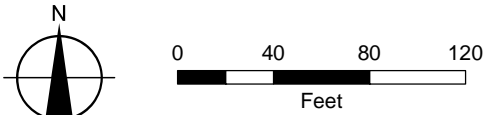
CVOC = chlorinated volatile organic compound
Conc. = concentration
Avg = average
µg/L = micrograms per liter
TCA = trichloroethane
DCA = dichloroethane
DCE = dichloroethene
U = not detected above the method reporting limit

Figures



FIGURE 1-1
Acid Sump Area Location
Acid Sump Source Area Excavation
ATI Wah Chang - Albany

- LEGEND**
- Monitoring Well
 - Extraction Well
 - Outfall
 - Manhole
 - Flakeboard Stormwater Line
 - Excavation Area
 - Roads
 - Railroad



MAP NOTES:
Date: December 22, 2015
Data Sources: Wah Chang, Aerial photo taken in March of 2010 by the City of Albany





FIGURE 2-1
Excavation Project Area
Acid Sump Source Area Excavation
ATI Wah Chang - Albany

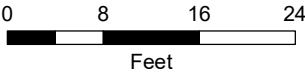
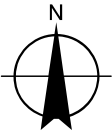
- LEGEND**
- Existing Monitoring Well
 - 2-inch Injection and Extraction Well
 - Existing 1-inch Geoprobe Well
 - Abandoned Borehole
 - Approximate Excavation Area
 - Controlled Work Zone

JUNE 10, 2015 GROUNDWATER RESULTS

WELL ID ———
PW-11
TCE: 0.5
TCA: 11000

SAMPLE RESULT ———
(:g/L)

RED indicates result exceeds cleanup standard.
TCA = 1,1,1-Trichloroethane
DCA = 1,1-Dichloroethane
PCE = Tetrachloroethene
TCE = Trichloroethene
DCE = 1,1-Dichloroethene
U = not detected at or above the reporting limit
J = estimated value below the reporting limit



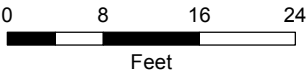
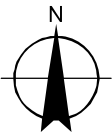
MAP NOTES:
Date: May 2, 2016
Data Sources: Wah Chang, Aerial photo taken in March of 2010 by the City of Albany





FIGURE 4-1
Excavation Area Layout
Acid Sump Source Area Excavation
ATI Wah Chang - Albany

- LEGEND**
- Approximate Excavation Area
 - Existing Monitoring Well
 - Existing 1-inch Geoprobe Well
 - Attempted Extraction Well
 - Manhole
 - Utility Pole
 - Predesign Boreholes (2015)
 - Abandoned Drain Line
 - Utility Corridor
 - Active Acid Sump Conveyance Corridor
 - Overhead Acid Line
 - Flakeboard Stormline
 - Cross Sections
 - Equipment Ingress/Egress
 - Equipment Wash Area
 - Groundwater Treatment Area



MAP NOTES:
Date: December 21, 2015
Data Sources: Wah Chang, Aerial photo taken in March of 2010 by the City of Albany



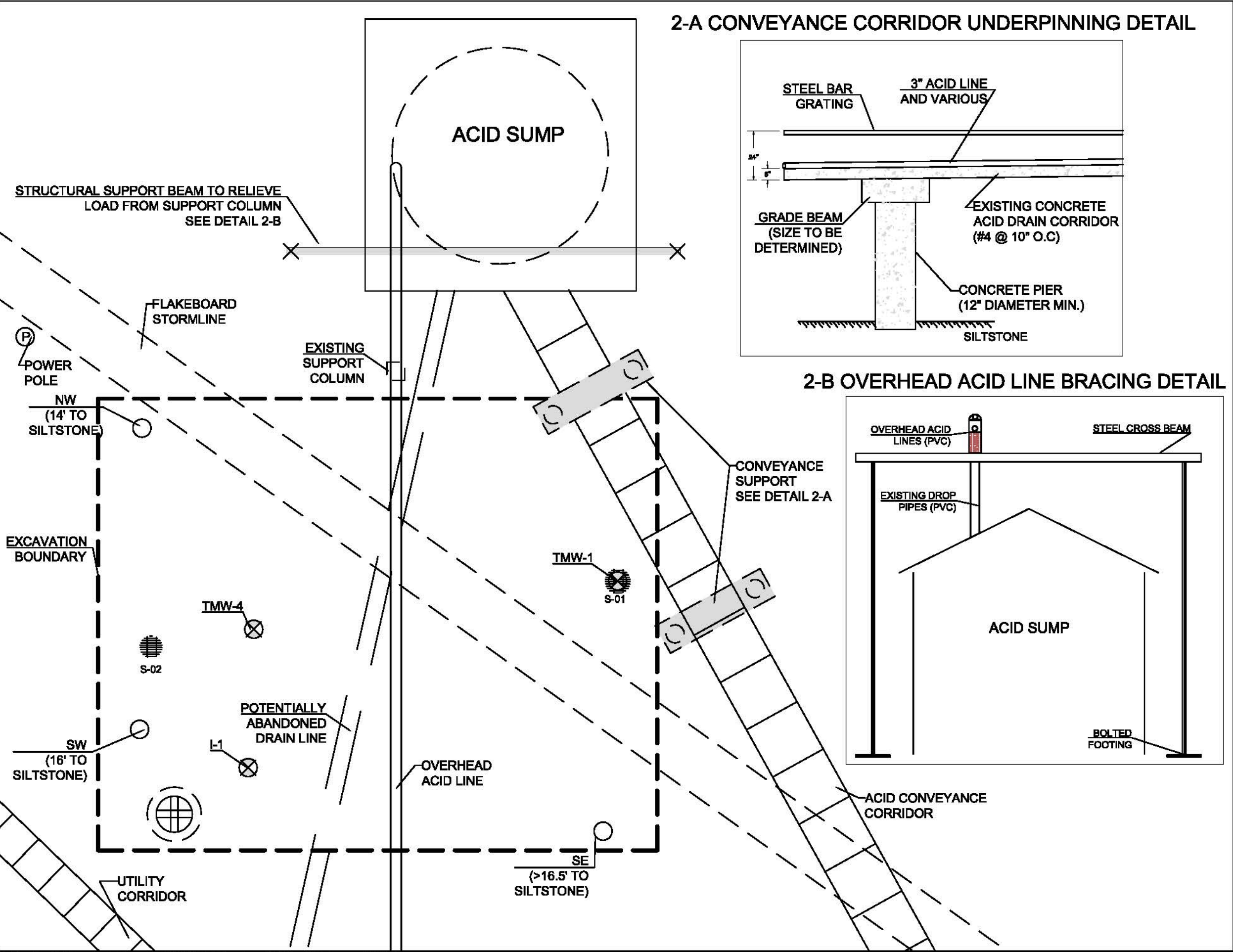


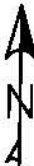
Figure 4-2
Excavation Plan Detail
 Acid Sump Source Area Excavation
 ATI Wah Chang - Albany

LEGEND

- EXISTING WELL
- EXCAVATION BOUNDARY
- SUMP LOCATION
- UTILITY BRACING
- UTILITY CORRIDOR
- UTILITY POLE
- MANHOLE
- PRE-DESIGN BOREHOLE (2015)

- NOTES:**
- EXCAVATION WIDTHS ARE DERIVED FROM FIELD MEASUREMENTS.
 - SILTSTONE FORMATION ALSO KNOWN AS SPENCER FORMATION.
 - STRUCTURAL SUPPORT ELEMENT LOCATIONS ARE APPROXIMATE AND MAY BE ADJUSTED BASED UPON SITE CONDITIONS.
 - STRUCTURAL SUPPORT BEAM SELECTION SPACING SPECIFICATION PER WAH CHANG ENGINEERING RECOMMENDATION.
 - FLAKEBOARD STORMLINE AND ABANDONED DRAIN LINE LOCATIONS ARE APPROXIMATE.
 - NOT ALL ELEMENTS TO SCALE.

STRUCTURAL ELEMENTS ARE PRELIMINARY



April 29, 2016



ACID SUMP

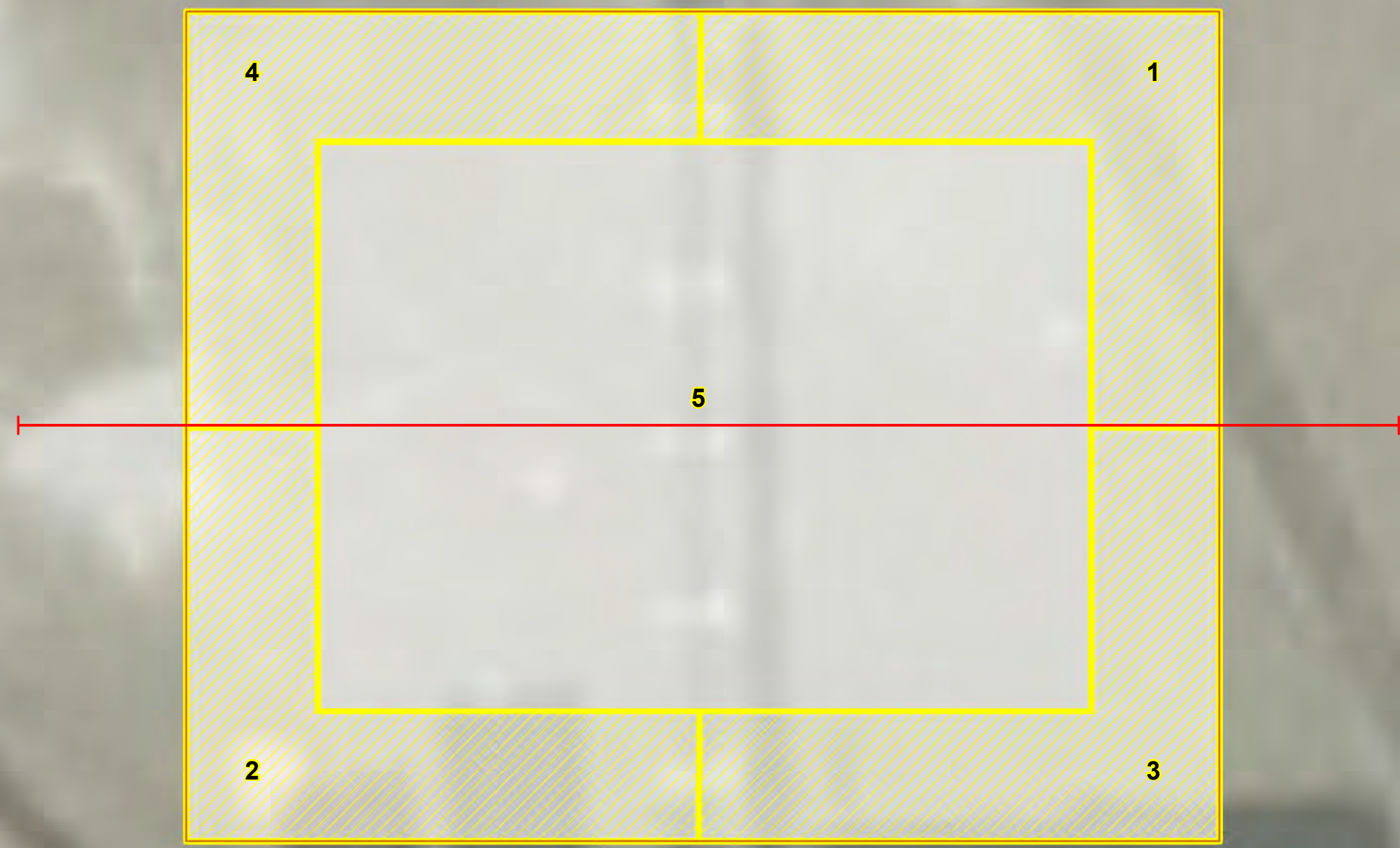





FIGURE 4-3

Excavation Sequence

Acid Sump Source Area Excavation
ATI Wah Chang - Albany

LEGEND

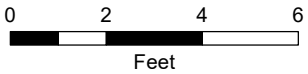
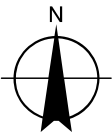
-  Approximate Excavation Area
-  Excavation Sequence
-  Cross Sections

Notes:

The soil removal will proceed sequentially around the perimeter of the excavation (1-2-3-4) in a strip approximately 4 feet wide. Sections are ordered to allow time for curing and hardening of the lean concrete backfill.

Interior section 5 will be excavated after perimeter sections 1 through 4 have been completed.

Sections may be further divided during the course of the project based on field conditions observed during the dig and the recommendations of the foundation geologist at the site.

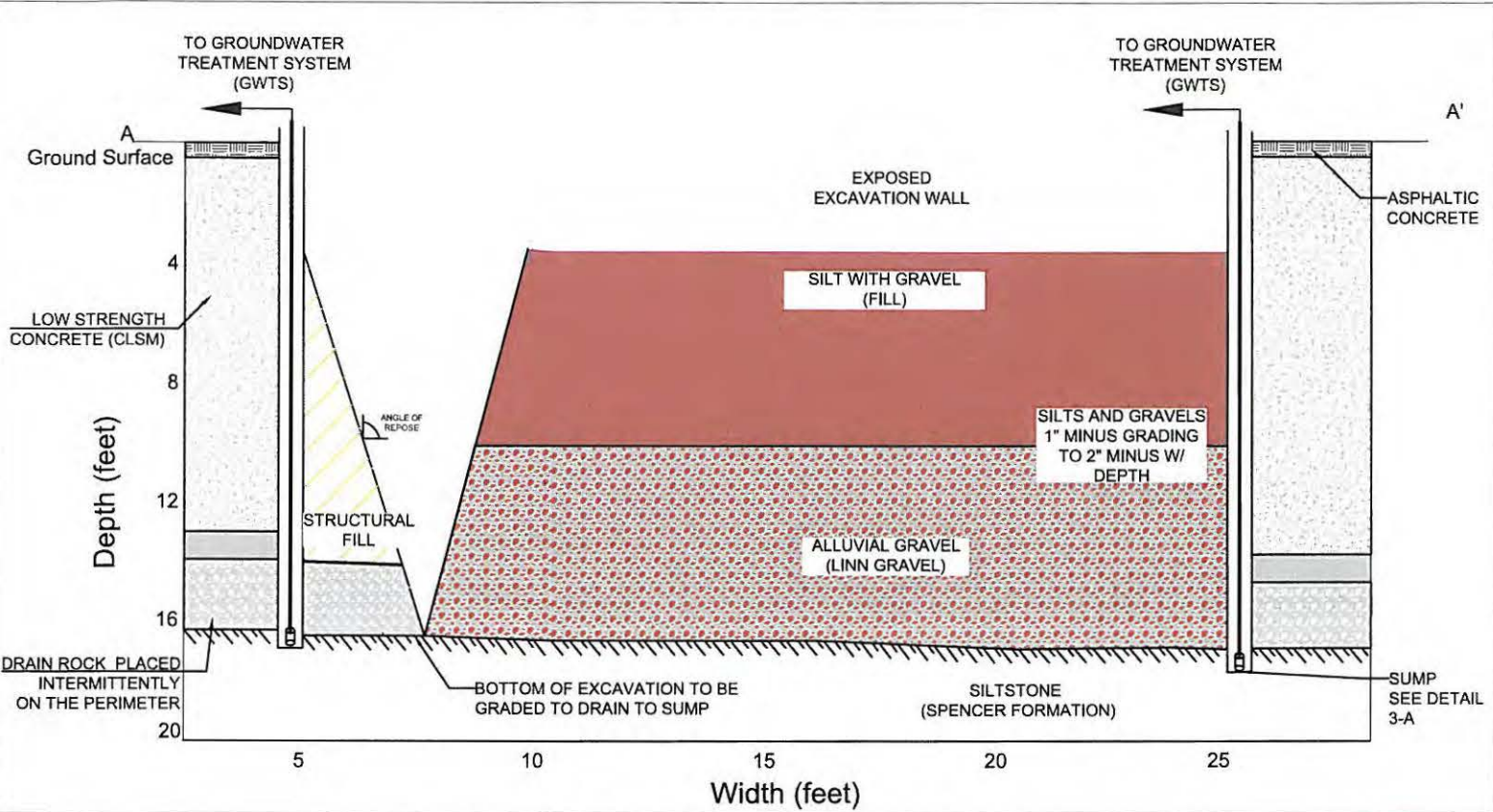


MAP NOTES:

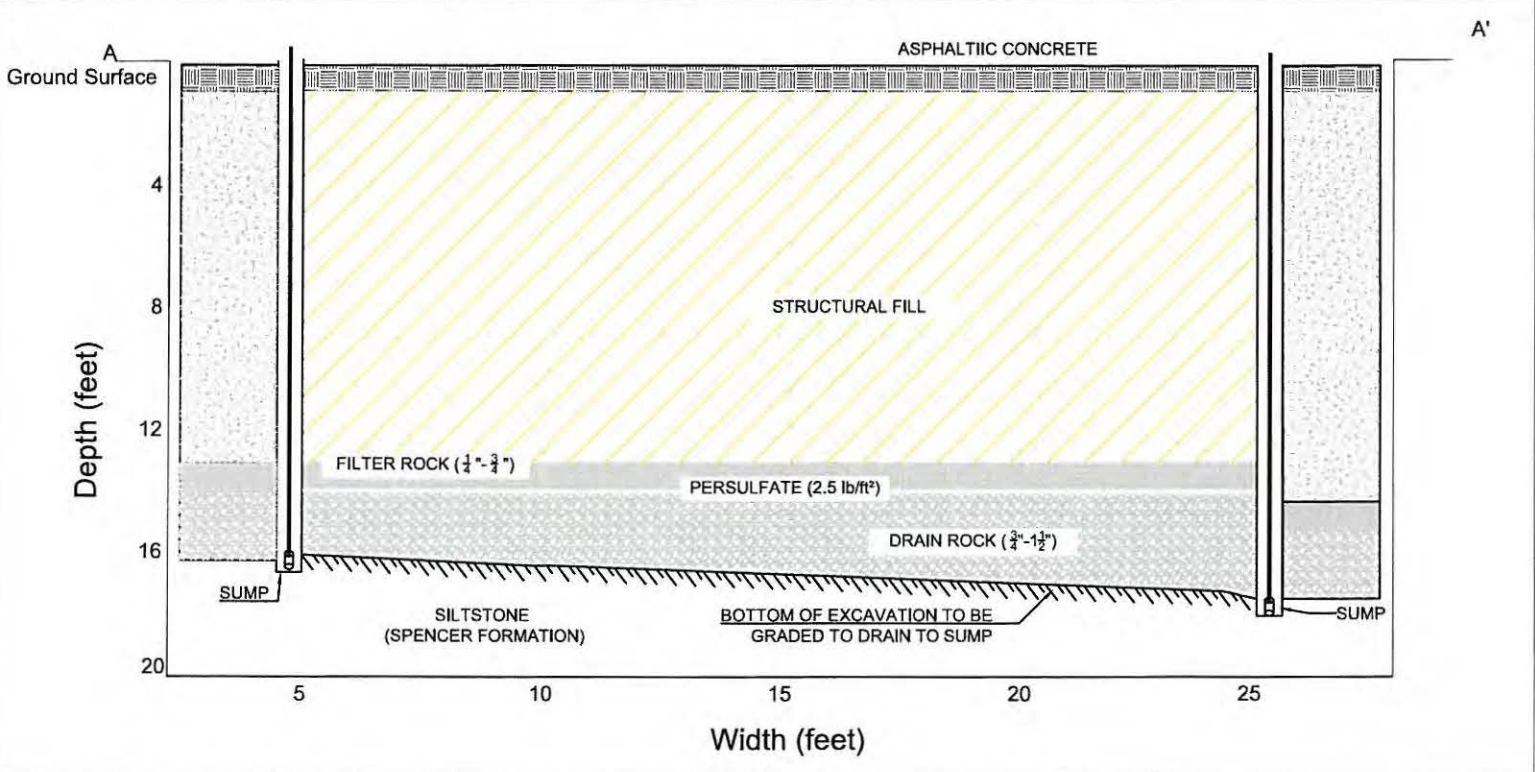
Date: May 2, 2016
Data Sources: Wah Chang, Aerial photo taken in March of 2010 by the City of Albany



EXCAVATION CUT AND FILL PROFILE A-A'



FINISHED BACKFILL PROFILE A-A'



3-A SUMP CONSTRUCTION DETAIL

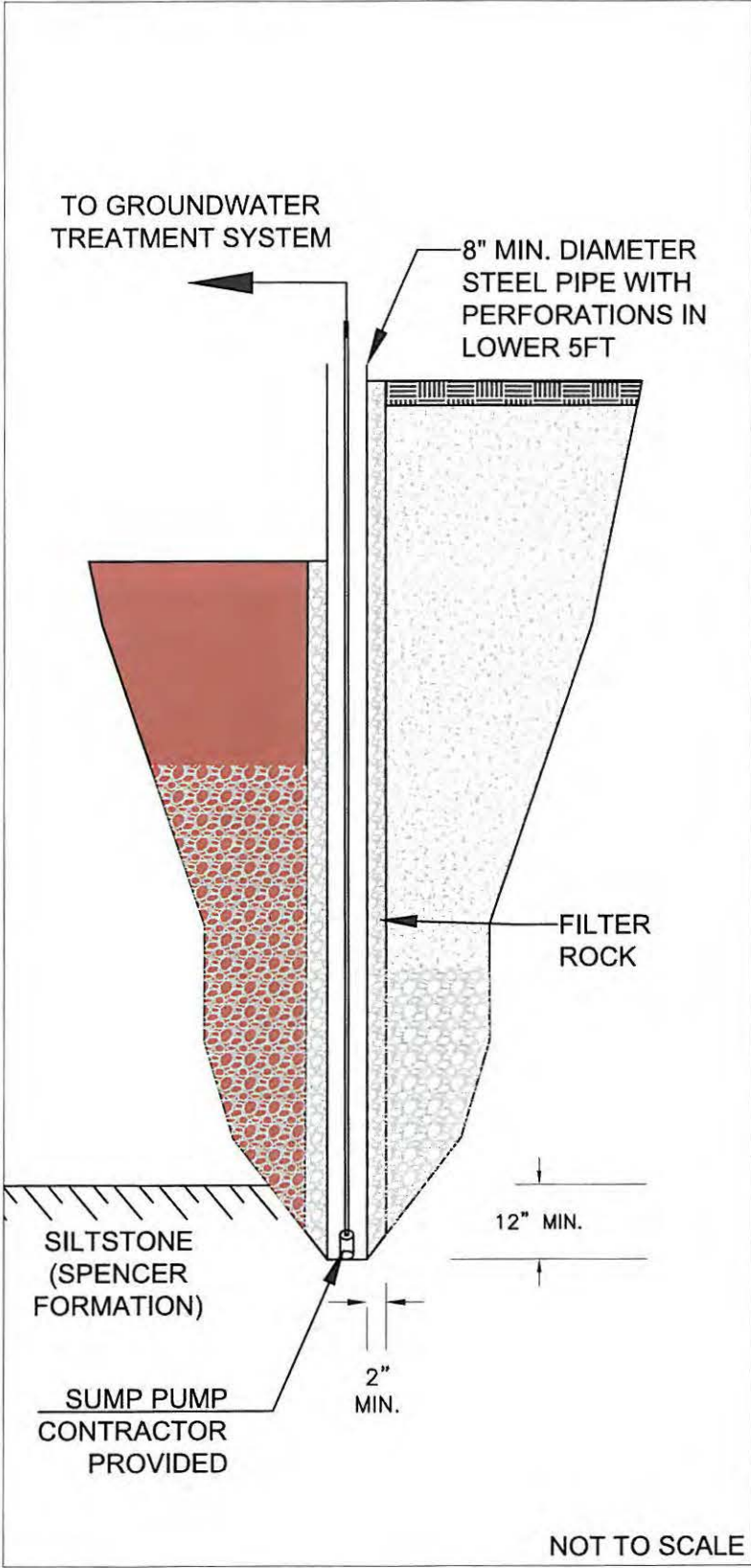


Figure 4-4

Excavation and Backfill Profile
Acid Sump Source Area Excavation
ATI Wah Chang - Albany

LEGEND

- STRUCTURAL FILL
- SAND AND GRAVEL FILL
- SILT WITH GRAVEL (FILL)
- ASPHALTIC CONCRETE
- DRAIN AND FILTER ROCK
- ALLUVIAL GRAVEL
- CONTROLLED LOW STRENGTH CONCRETE (CLSM)
- EXPOSED EXCAVATION SIDE WALL

NOTES:
- LITHOLOGY DERIVED FROM ACID SUMP AREA BORING LOGS AND PRE-DESIGN BOREHOLES (2015).



April 29, 2016



SECTION A: PROFILE OF INITIAL TREATMENT PILE

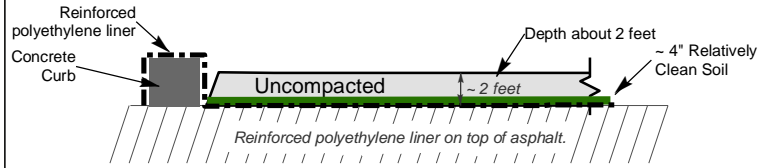


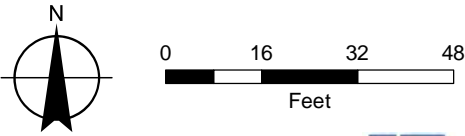
FIGURE 5-1

Soil Treatment Area
Acid Sump Source Area Excavation
ATI Wah Chang - Albany

LEGEND

- Discrete Sample Location
- Cross Section
- Concrete Curb
- Wet Soil Drop Box
- Vehicle Wash Station
- Soil Treatment Pile, ~12,000 sq. ft.
- Debris Contingency Area, ~900 sq. ft.

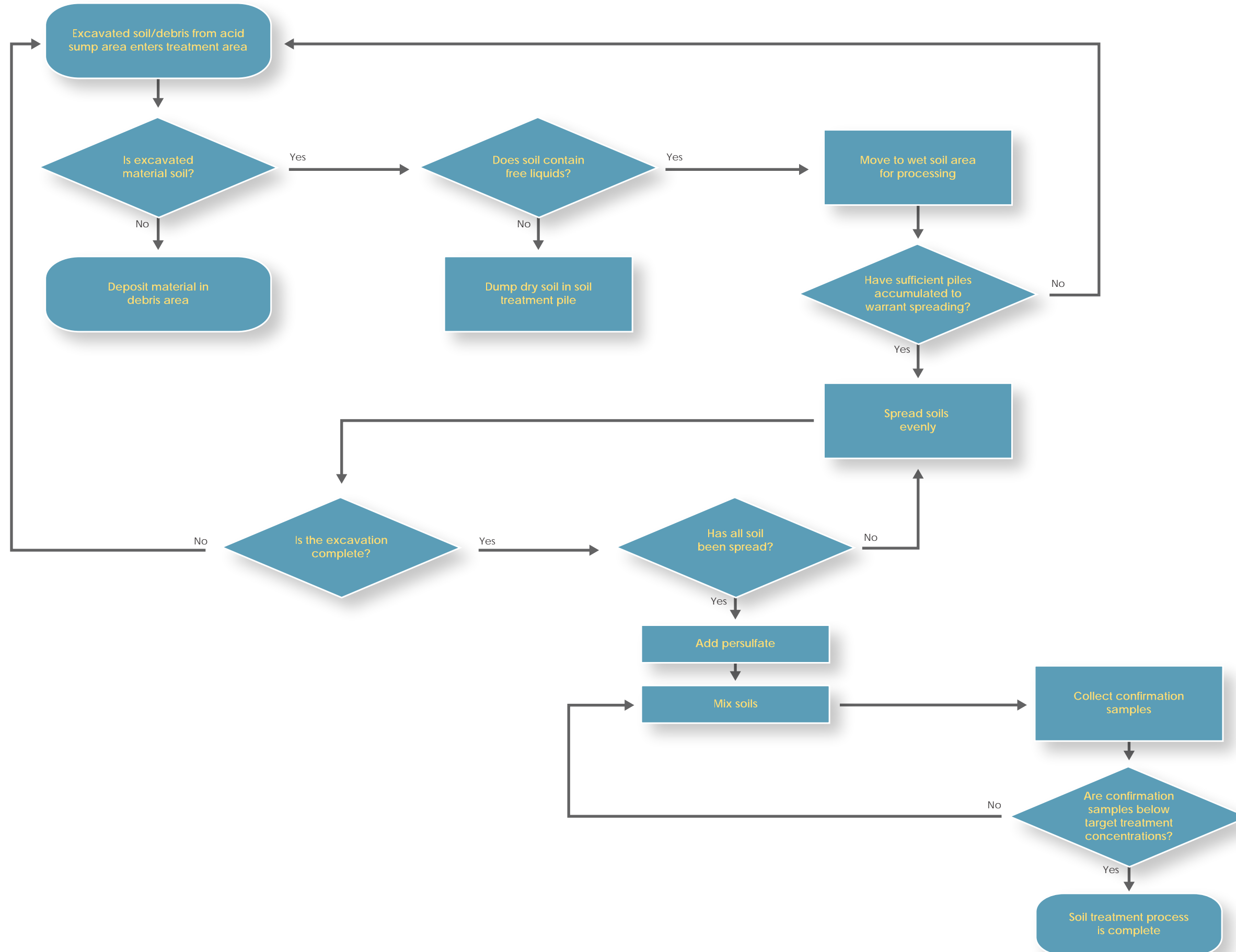
NOTE:
Soil treatment and mixing will continue until analytical results demonstrate that concentrations of chlorinated volatile organic compounds have fallen below target treatment concentrations and RCRA toxicity standards for depositing treated soils in a Subtitle D landfill.



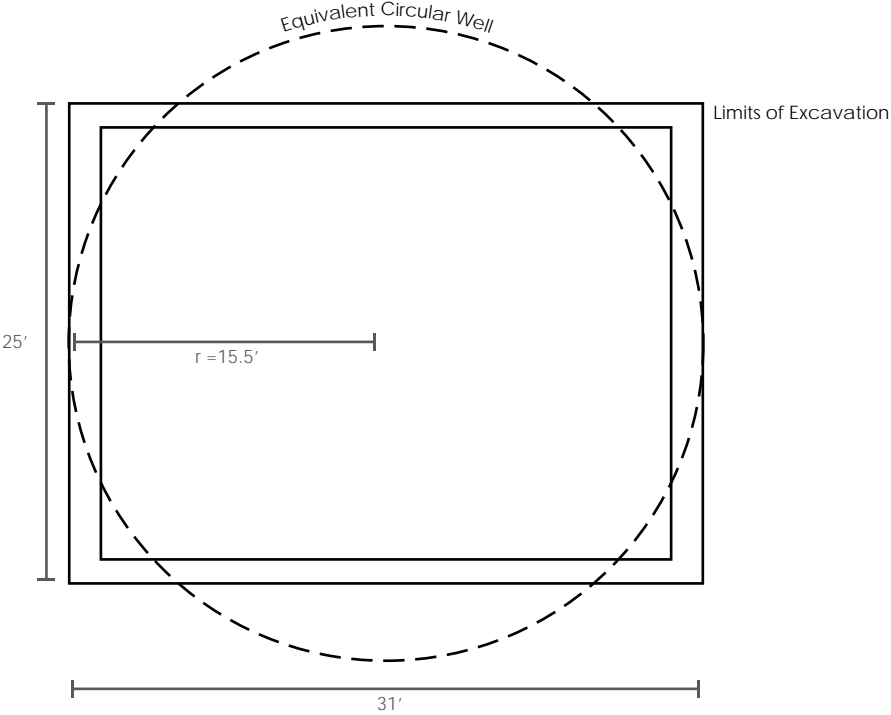
MAP NOTES:
Date: June 21, 2016
Data Sources: Wah Chang, Aerial photo taken in March of 2010 by the City of Albany



FIGURE 5-2
Soil Treatment Process
Acid Sump Source Area Excavation
ATI Wah Chang - Albany



A. PLAN



B. PROFILE

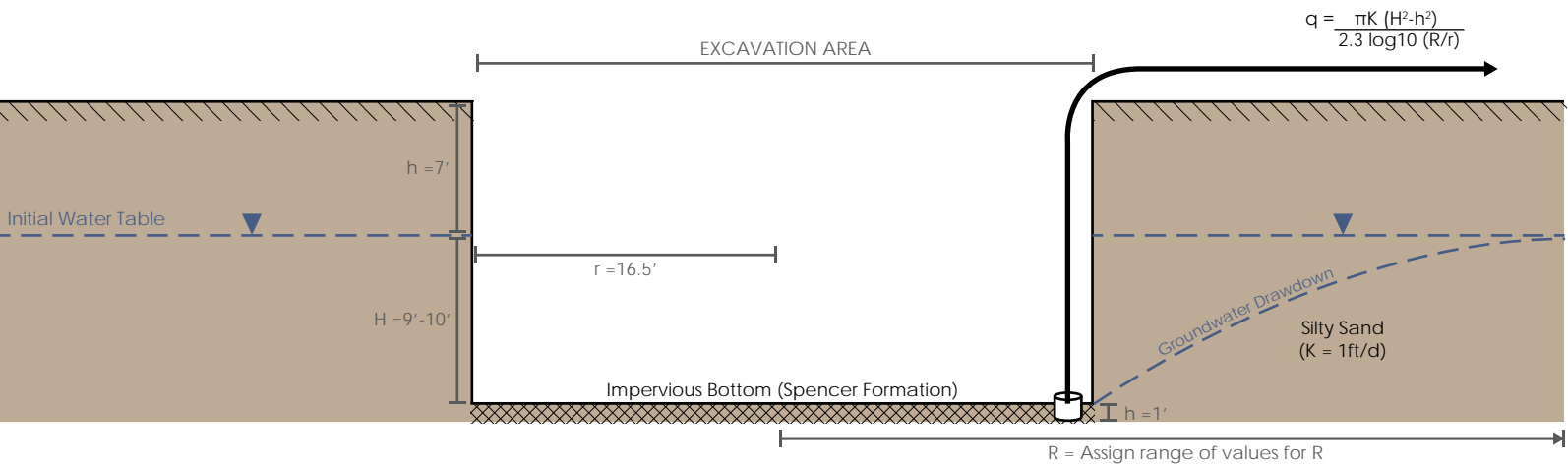


FIGURE 6-1

Design Groundwater Infiltration Rates
Acid Sump Source Area Excavation
ATI Wah Chang - Albany

WHERE:

- q = Estimated dewatering rate at steady state (ft³/d)
- r = Radius of excavation, ft
- R = Radius of influence to drawdown, ft
- K = Hydraulic conductivity, ft/d
- H = Height from impervious layer to original water table, ft
- h = Height from impervious layer to drawdown level, ft

Assign Range of R Values to Estimate Q:

R	Q(ft ³ /d)	Q(GPM)
20'	1635	8.5
50'	283	1.5
200'	126	0.65
500'	92	0.5

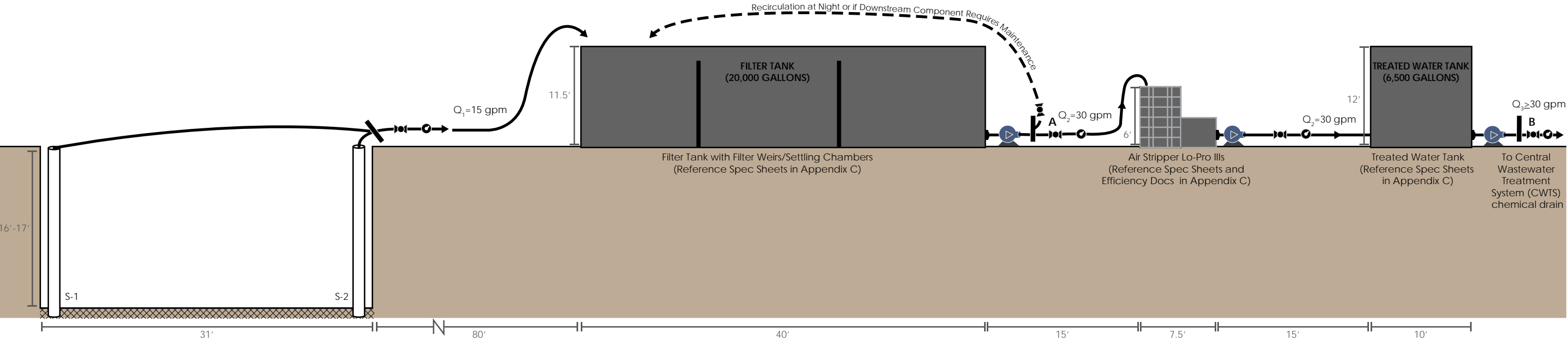
If K = 2ft/d, Q is Estimated as:

R	Q(ft ³ /d)	Q(GPM)
20'	3270	17
50'	567	3.0
200'	252	1.3
500'	182	1.0

Conservative Design Infiltration Rate,
Q = 15 gpm



A. PROFILE



B. PLAN

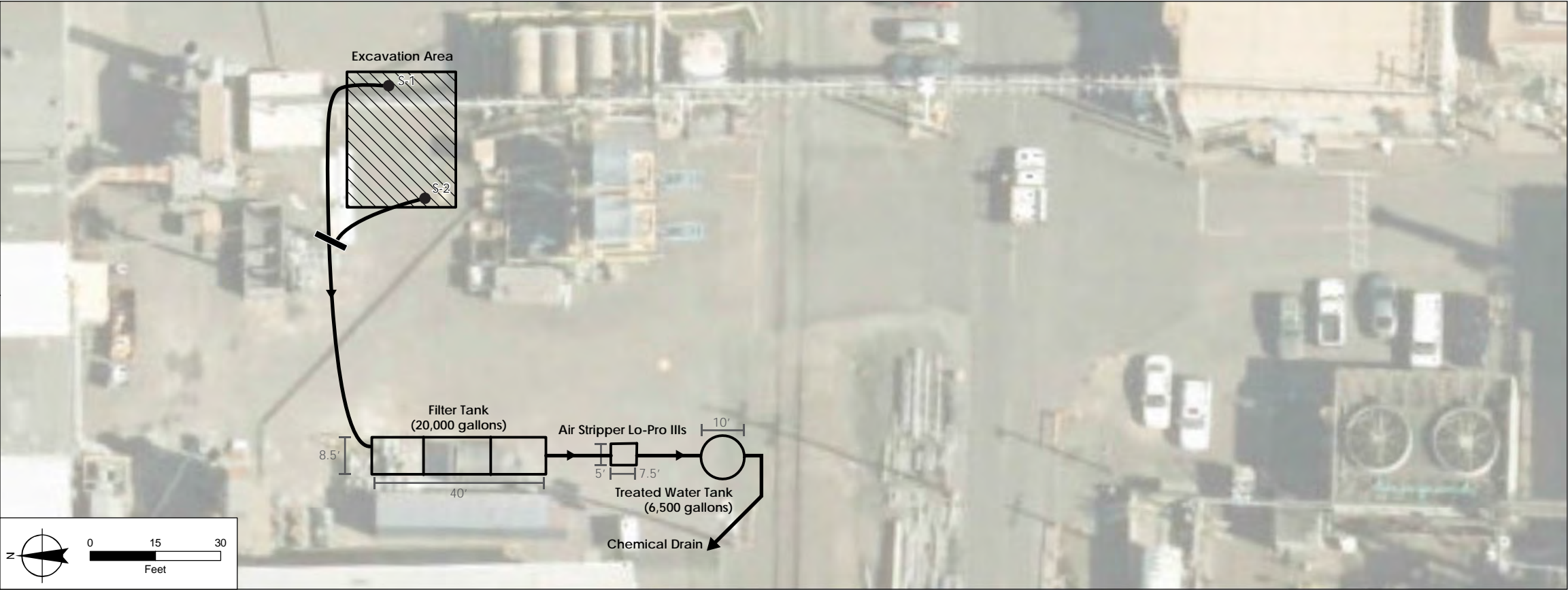


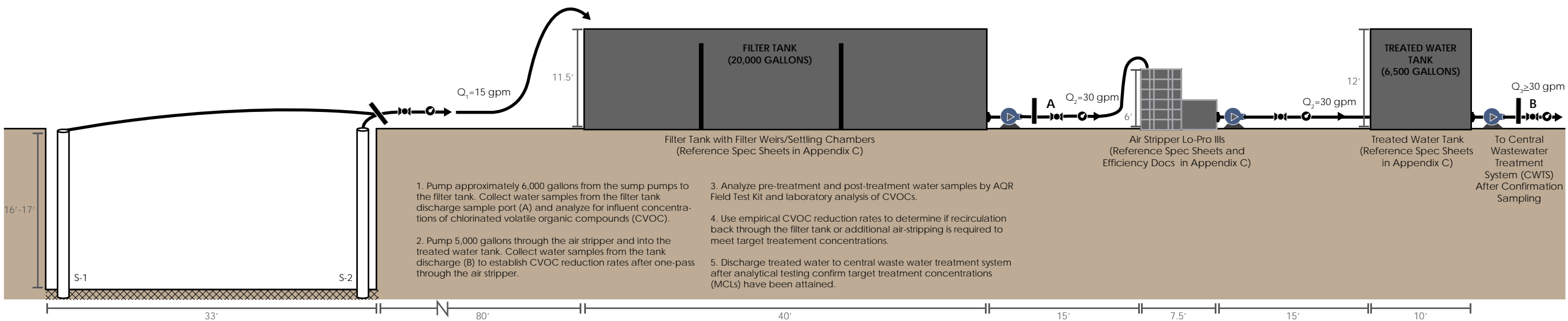
FIGURE 6-2
Groundwater Treatment Plant (GWTP)
Schematic
Acid Sump Source Area Excavation
ATI Wah Chang - Albany

LEGEND

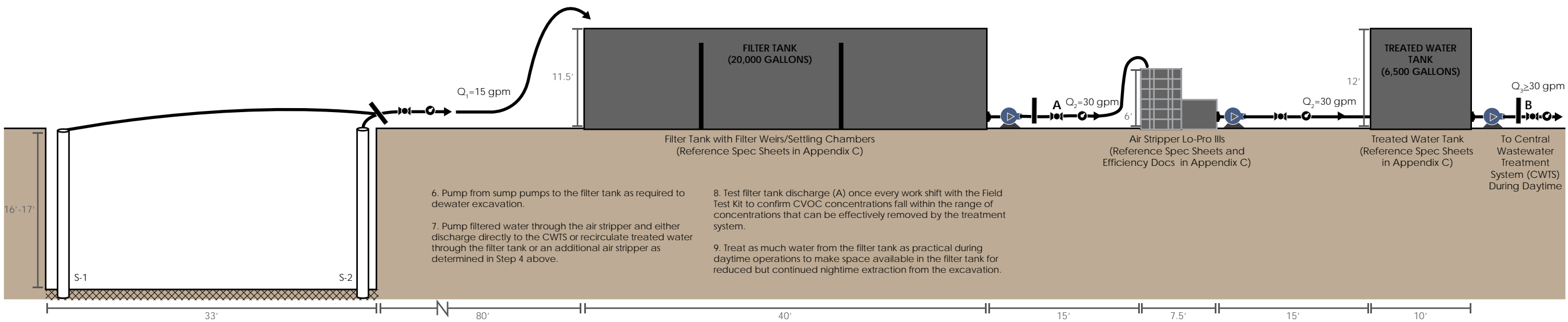
- Sump Pumps
- Pump
- Manifold
- Flow Control Valve
- Flow Meter
- A = Influent Sample Point
- B = Effluent Sample Point



A. Pre-Excavation Sump Installation and Performance Testing



B. Daytime Operation



C. Nighttime Operation

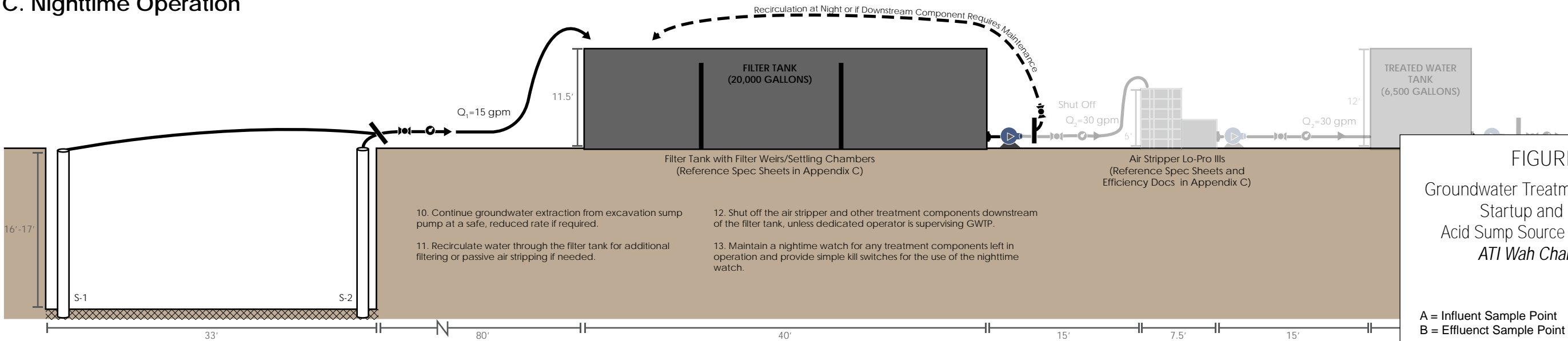


FIGURE 6-3
Groundwater Treatment Plant (GWTP)
Startup and Operation
Acid Sump Source Area Excavation
ATI Wah Chang - Albany

A = Influent Sample Point
B = Effluent Sample Point



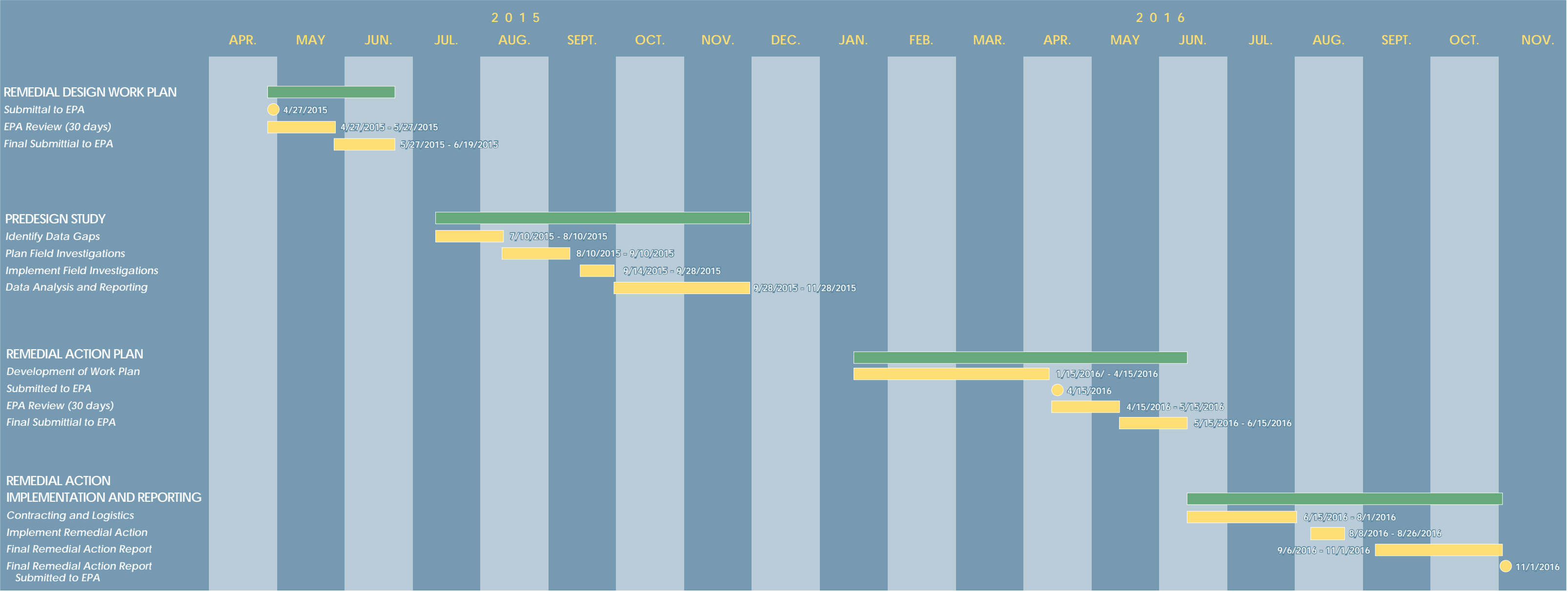


FIGURE 7-1
Project Schedule
Acid Sump Source Area Excavation
ATI Wah Chang - Albany





Boring ID

NW

Project Number

0168.022.003.001 Sheet 1 of 1

SOIL BORING LOG

Project: AS PRE-DESIGN

Location: ATI WAH CHANG, ALBANY, OR

Drilling Contractor: CASCADE

Drilling Method: 6in SONIC-TRACK MOUNT

Start Date: 1150

End Date: 1320

Field Personnel: P. PELLEGRIN

Sampling Method: COMPOSITE

Water Levels:

Start Card No: L

OWRD ID:

Total Depth: 16.5 FT

Depth Below Surface (ft)	Sample		Description Soil Name, USCS Group Symbol, Color, Moisture, Relative Density/Consistency, Soil Structure, Mineralogy	Comments Air Monitoring/PID Readings, Sheen/Odor, Issues Encountered, Water Levels
	Sample Interval/ Recovery	Lab Sample Interval		
2.5	0	TO	ASPHALT - 0 to 4 in LOOSE, DRY, BROWN SAND AND GRAVEL FILL TO 2 FT	0.0 ppmV AT 2 FT
5	8	FT	DENSE, GRAY, MOIST SILT CML) WITH CLAY. 2 FT to 6 FT	0.0 ppmV AT 3 to 4 FT
7.5			DRY, BROWN SILT CML) WITH 1 in MINUS SUB-ROUNDED GRAVELS: 6 TO 8 FT	0.0 ppmV (7 to 8 FT)
10	8	TO	LOOSE, YELLOW-BROWN GRAVEL (GM) WITH SILT AND COARSE SAND. GRAVELS 2 in MINUS SUB-ROUNDED. 8 to 11 FT.	68 ppmV (11 FT)
12.5	11	TO	LOOSE, GRAY, WET GRAVEL (GM) WITH COARSE SAND. GRAVELS 3 in MINUS, SUB- ROUNDED. 11 to 13 FT.	SPT 10-15-FT (10-12.5 FT) ODOR (12-13 FT)
15	14	FT	DENSE, GRAY, DRY, WEATHERED SILTSTONE (SPENCER FORMATION) 14 TO 15 FT.	74 ppmV (13 FT)
			TD - 16.5 FT	SPT 50-50-2 in (15 to 16.5 FT)

SPT = STANDARD PENETRATION TEST



Boring ID

SE

Project Number

0168.022.003.001

Sheet 1 of 1

SOIL BORING LOG

Project: AS PRE-DESIGN

Location:

Drilling Contractor: CASCADE

Drilling Method: 6-in SONIC

Start Date: 08-03-15

End Date: 08-03-15

Field Personnel: P. PELLEGRIN

Sampling Method: COMPOSITE

Water Levels:

Start Card No: L

OWRD ID:

Total Depth: 16.5 ft

Depth Below Surface (ft)	Sample		Description Soil Name, USCS Group Symbol, Color, Moisture, Relative Density/Consistency, Soil Structure, Mineralogy	Comments Air Monitoring/PID Readings, Sheen/Odor, Issues Encountered, Water Levels
	Sample Interval/ Recovery	Lab Sample Interval		
0		0	ASPHALT. 0 to 5 in.	
2.5		5 FT	LOOSE LIGHT BROWN DRY GRAVELS AND SAND (FILL). GRAVELS 1-1/2 in MINUS AND ANGULAR. 5-in to 4 ft.	0.0 ppmv (at 2 ft)
5.0			LOOSE, DRY, BROWN SILT WITH 1/4-in MINUS ROUNDED GRAVELS. BRICK FRAGMENTS.	0.0 ppmv (at 5 ft) SPT - 0 (NO RESISTANCE AT 5-6.5 ft)
7.5			DENSE, GRAY, MOIST SILT (ML) WITH SOME WELL GRADED GRAVELS. 5.5 to 9 ft.	12.0 ppmv (at 7 ft)
10		9 TO 12 FT	DENSE, YELLOW-BROWN SILT (ML) WITH GRAVEL. SUB ROUNDED 3-in MINUS. 9 to 12 ft.	54 ppmv (at 10 ft) SPT 8-13-22 (10-11.5 ft)
12.5				7.2 ppmv (at 12 ft)
15		12 TO 15.5 FT	LOOSE, GRAY, MOIST GRAVEL (GM) WITH SILT. GRAVELS SUB ROUNDED AND WELL GRADED. MANY FINE COARSE GRAVELS 1/8-in MINUS. 12 to 15.5 ft.	10.1 ppmv (at 15 ft) SPT 2-5-11 (15-16.5 ft)
			TD - 16.5 ft	

SPT = STANDARD PENETRATION TEST



Boring ID

SW

Project Number

0168,002,003.001 Sheet 1 of 2

SOIL BORING LOG

Project: AS PRE-DESIGN Location: ATI WAH CHANG, ALBANY, OR

Drilling Contractor: CASCADE Drilling Method: 6-in SONIC

Start Date: 08-03-15 End Date: 08-03-15 Field Personnel: P. PELLEGRIN

Sampling Method: COMPOSITE Water Levels:

Start Card No: L

OWRD ID:

Total Depth: 20 FT

Depth Below Surface (ft)	Sample		Description Soil Name, USCS Group Symbol, Color, Moisture, Relative Density/Consistency, Soil Structure, Mineralogy	Comments Air Monitoring/PID Readings, Sheen/Odor, Issues Encountered, Water Levels
	Sample Interval/ Recovery	Lab Sample Interval		
0			ASPHALT. 0 to 5-in	
2.5		0 TO 7.5 FT	LOOSE, DRY TO MOIST GRAVEL FILL WITH SAND. 5-in to 4ft	0.0ppmV (2ft)
5.0			DENSE, GRAY, MOIST SILT (ML) WITH ORANGE MOTTLING SOME CERAMIC FRAGMENTS. 4ft to 7.5ft.	0.00ppmV (4ft) SPT 2-2-5 (5ft to 6.5ft)
7.5				0.0 ppmV (7ft)
10		7.5 TO 10 FT	LOOSE, YELLOW, MOIST GRAVEL (GM) WITH COARSE SANDS. SUB-ROUNDED 2-in MINUS GRAVELS. 10ft to 14ft.	0.0ppmV (9ft) SPT 21-18-21 (10ft to 11.5ft)
12.5				7.6 ppmV (11ft)
				14.4 ppmV (13ft)
15		14 TO 16 FT	LOOSE, GRAY GRAVELS (GM) WITH COARSE SANDS AND MANY 1-in MINUS ROUNDED GRAVELS. WET. 14ft to 16ft.	0.0ppmV (15ft) SPT 50-5in (15ft)

SPT = STANDARD PENETRATION TEST

GS FORM:
BORE 1/99

BOREHOLE RECORD

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES					TIME	COMMENTS
				SAMPLE NAME	TYPE	BLOW COUNTS	% RECOVERY	PID READING (ppm)		
1	Asphalt.						100			Temporary well consisted of 1-inch diameter 0.010-inch slot schedule 40 PVC screen set from 10 to 15 feet bgs to facilitate groundwater sample collection.
2	<u>Fill</u> : Sandy gravel, brown to gray, dry.									
3	Clayey silt with trace gravel (angular ~4mm), moist, dense, medium to high plasticity.									
4										
5							90			
6	Gravel (fine), dark gray to brown, moist.									
7	<u>Willamette Silt</u> : Sandy silt, brown with mottled reddish-brown, moist.									
8	Becomes wet.									
9	<u>Linn Gravel</u> : Sandy silt with some gravel, brown, dry, well-graded.			SB-04-9.5-10						
10				GW-04-10-15			100			
11										
12				SB-04-12.5-13						
13				SB-04-13-13.5						
14	Sandy gravel (fine, angular), little silt, green-gray, wet.			SB-04-14-14.5						
15	<u>Spencer Formation</u> : Siltstone (weathered), green-gray, moist.			SB-04-14.5-15			100			
16	Total boring depth = 16' bgs.									

CONTRACTOR Boart Longyear

EQUIPMENT Geoprobe 6620

DRILL MTHD Direct Push

DIAMETER 2.25"

LOGGER EKM

REVIEWER JW

NORTHING

EASTING

ANGLE Vertical

BEARING -----

PRINTED Jan 14, 09

REMARKS: Borehole backfilled with bentonite granules. Soil sample interval indicated in sample name by last two values. Temporary well screened interval indicated in groundwater sample by last two values.

COORDINATE SYSTEM:

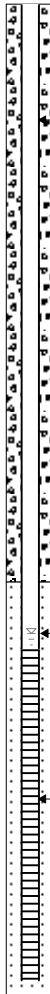
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

Well Number: I-1

Sheet: 1 of 1

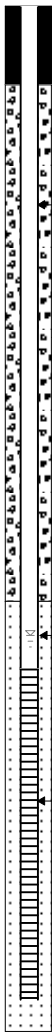
Client: Wah Chang
Project: Acid Sump Area
Location:
Project Number: 168-009

Driller: Cascade Drilling
Drilling Method: Geoprobe truck- mounted 6600
Sampling Method:
Logged by: Chris Augustine
Start/Finish Date: 7/8/09 1510- 1530

Depth (ft)	Sample Info		Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
	Sample Interval	Recovery					
0				Ground Surface	0		Background = 0.0 ppm 4-inch Diameter Borehole (0'-15') 2-inch Diameter PVC Casing (0'-9.75') 3/8-Sodium Bentonite Seal (0'-8.75') DTW = 9.5' bgs on 7/8/09 Sheen, odor, PIU = 85 ppm at 9.5' 8/12 Prepacked Colorado Silica Sand (9.75'-15') Prepack 2-inch Diameter, 20 Slot Screen (9.75'-14.75') TD at 15'
	SS	2.5		Concrete	0		
					-2		
				Silty gravel with sand, (GM/CM) orange brown, soft push moist, loose, sand ~ 35%, 30% silt, gravel 35%	2		
	SS	5			-4		
				Silt (ML), orange brown, moist, soft, low plasticity, sand 10-15% fine. A/A, minor GM layer at 6.7 feet	4		
5					-8		
	SS	3.75		Silty gravel (GM), buff to grey to red brown, dry, loose-medium dense, gravel to 1" silt 35% sand 10-15% As above with sand to 25%, poorly graded sand SP with gravel, orange brown, wet loose, silt 15%	8		
10					-14		
				Silty gravel (GM), red-brown-green, moist to wet, weathered bedrock in gravel	14		
15					-18		
				Weathered siltstone, green-blue, dry, oxidized on weathered surface	18		
20							

Sheet: 1 of 1

Driller: Cascade Drilling
Drilling Method: Geoprobe truck- mounted 6600
Sampling Method:
Logged by: Chris Augustine
Start/Finish Date: 7/8/09 1340- 1415

Depth (ft)	Sample Info		Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes	
	Sample Interval	Recovery						
0				Ground Surface	0		Background PID = 0.0 (only recorded due to visible contamination in I-2)	
	SS	2.1		Concrete	0		4-inch Diameter Borehole (0'-15.5')	
				-1			Concrete Surface Seal (0'-1.2')	
				Silty gravel (GM), orange brown to grey, moist, loose	1		2-inch Diameter PVC Casing (0'-10')	
5	SS	2.75		Silt (ML) brown, moist, soft, sand- 10%	-5		3/8-Sodium Bentonite Seal (1.2'-9')	
				5				
				-6	Silty gravel (GM), grey-brown, wet, loose, silt ~ 30%, sand 10-15%		6	
				-7	Silt, ML, brown, moist, soft, low plasticity		7	
10	SS	5		Silty gravel with sand (GM), brown orange; wet, loose, sand fine to coarse 25%, silt 30%, not plastic, gravel 10 1", angular to subrounded	-10	DTW = 9.5' bgs on 7/8/09 Sheen, odor, PID = 75.2 ppm		
				10			8/12 Prepack Colorado Silica Sand (9'-15.5')	
				A/A, dry, orange-brown-red, mottled	-13	Prepacked 2-inch Diameter, 20 Slot Screen (10'-15')		
					13			
15	SS			Silty gravel (GM), wet, dense, gravel to 1/2", silt brown 30%	15	H2O no sheen		
				Weathered siltstone, green-blue to bright green, hard, dry, sand 20-30% fine	-16	TD at 15.5'		
					16			

Well Number: I-3

Sheet: 1 of 1

Client: ATI Wah Chang
Project: Acid Sump EISB
Location: Albany, OR
Project Number: 168-009-T4

Driller: Cascade
Drilling Method:
Sampling Method:
Logged by: Chris Augustine
Start/Finish Date: 7/8/09 16:00, 7/8/09 16:30

Depth (ft)	Sample Info		Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
	Sample Interval	Recovery					
0				Ground Surface	0	<p>4-inch Diameter Borehole (0'-15')</p> <p>Concrete Surface Seal (0'-1.3')</p> <p>2-inch Diameter PVC Casubg (0'-10')</p> <p>3/8-Sodium Bentonite Seal (1.3'-9')</p> <p>8/12 Prepacked Colorado Silica Sand (9'-15')</p> <p>DTW = 11' bgs on 7/8/09</p> <p>Prepacked 2-inch Diameter, 20 Slot Screen (10'-15')</p>	<p>Dry</p> <p>No sheen, no odor</p> <p>H2O @ 14.5</p> <p>TD at 15'</p>
	SS	1.5		Concrete	0		
				Poorly Graded Gravel(GP), grey, dry, dense, silt 10-15%, sand fine to coarse 15%, gravel angular to subangular	-1		
				Poorly Graded Sand (SP), orange brown, moist, loose, gravel fine to 10% trace silt	-3		
5	SS	5		Silt (ML), brown to orange brown mottle, moist, stiff-medium stiff, low plasticity sand fine-medium 10% A/A	-5		
				Silty Gravel with Sand, orange brown to buff dry, loose, gravel to 1/2" round to angular silt = 30	-10		
10	SS	5		Poorly Graded Sand (SP), orange brown, wet, loose, grades silty at 12.0 ft to silty sand (SM) gravel 10-15% silt ~ 30%	-11		
				Silty Gravel (GM) with Sand, orange to brown to green, DRY moist, dense to not dense, gravel 3/4" angular to subround silt 35%, sand 20% fine to coarse	-13		
15				Weathered Silstone, blue-green to blue oxidized or weathered surfaces	-15		
					15		
20							


Well Number: EI-5

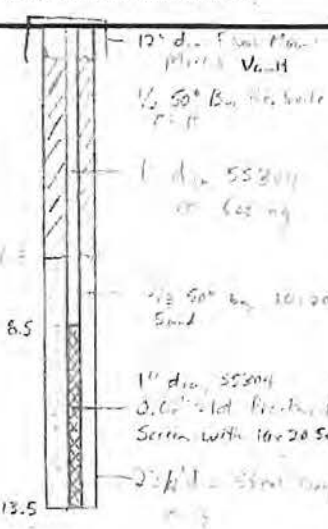
Sheet: 1 of 1

Client: ATI Wah Chang
Project: Acid Sump EISB
Location: Albany, OR
Project Number: 168-009-T4

Driller: Cascade Drilling, Clakamas, OR
Drilling Method: Truck Mounted Geoprobe
Sampling Method:
Logged by: Peter Pellegrin
Start/Finish Date: 7/9/09 07:00, 7/9/09 10:00

Depth (ft)	Sample Info		Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
	Sample Interval	Recovery					
0				Ground Surface	0	<p>4-inch Diameter Borehole (0'-16.5')</p> <p>Concrete Surface seal (0'-1.2')</p> <p>Dry</p> <p>2-inch Diameter PVC Casing (0'-11')</p> <p>3/8-Sodium Bentonite Seal (1.2'-10')</p> <p>Moist</p> <p>Moist</p> <p>8/12 Preppacked Colorado Silica Sand (10'-16.5')</p> <p>Prepacked 2-inch Diameter, 20 Slot Screen (11'-16')</p> <p>Moist</p> <p>Well Screen Dry TD at 16.5'</p>	
	SS	4		Asphalt and Concrete	0		
				Fill Material, dry, gravels 1/2" minus, angular gading to (GM)	-1		
	SS	5		Silty Gravel (GM), blue-grey, moist, plastic, poorly graded gravels 1/4"	5		
				A/A, orange-brown with some molting, moist	-8		
10	SS	3.5		Silty Gravel (GM), moist, well graded gravels 3/4" minus	13		
				Spencer Formation, blue-grey, plastic, dense, dry	17		
15	SS	1			-17		
					17		
20							

 CH2MHILL	PROJECT NUMBER 349339, 07 C3 FS	BORING NUMBER TALLU-1	SHEET <u>1</u> OF <u>1</u>
	<h2 style="margin: 0;">Monitor Well Geologic Log</h2>		
PROJECT: Wab. Cheng		LOCATION: Acid Courtyard	
ELEVATION: TGC = 207.14, Gage = 207.6		DRILLING CONTRACTOR: BLP - 1-88	
DRILLING METHOD AND EQUIPMENT USED: 1 1/2" Triax. Aligned, Casagrande 6000 with 2" dia. Core Tube 5 ft long			
WATER LEVELS: 703.20 12-20-07		START: 10-24-07 1130 END: 10-24-07 1230 LOGGER: S. R. Kinley	

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)			STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	RECOVERY (FT)	#/TYPE				
		#	TYPE			
1210	0	2.5	C1	1183	SILTY GRAVEL (D:25) dry-moist, light olive gray, densest/silt/clay? CLAYEY SILT (2.5-3.5) - moist to wet, light brown, soft plastic SILTY SAND (3.5-4') - wet, med. brown med dense, potential obstruction at 4.5 ft. Unable to pull drill rods back. Concrete 4.5-4.8 ft. SILTY/SANDY GRAVEL (5-9.7') - wet, gray-brown, subrounded gravel to 1" dia, med coarse sand, dense. 2" gravel placed sample at 6.2 ft.	 12" dia. 5' cas. Mon. Plastic Vane 1/2" 50' Bu. No. hole 5' ft 1" dia. SS 30' or 60' ng 1/2" 50' Bu. 10/20 Sand 1" dia. SS 30' 3.0" x 10' Plastic Screen with 10x20 Seal 2" dia. 5' Steel Trap
1225 1300	5	5	C2	1253	Wood fiber (9.7-9.9') - wet, light brown Silt (9.7-10') - wet, dark gray, soft SILTY/SANDY GRAVEL (10-14') - wet, dark gray with iron staining at 13.6-14', fine silt sand interval 10.5-11 ft Dense.	
1315	10	10	C3	931	Refusal	
1330	15				Refusal	
20					1" dia. casing and 10' casing Collect 100g Samples (5 pieces) at 11 ft and 13.7 ft [GM] Collect 100g Samples at 11 ft and 13.7 ft • Sample for VOC analysis	

0900 Acid case for Wab. Cheng
 0920 Wab. Cheng report and core logs
 1215 Bore for Wab.
 1130 Bore for Wab. Cheng
 EP-08.50 Revision 8/31/99
 330 Refusal at 14 ft

Sample times 11 ft = 1330
 13.7 ft = 1345

**CH2MHILL**

PROJECT NUMBER

346334.07 C3 FS

BORING NUMBER

TMW-3

SHEET 1 OF 1

Monitor Well Geologic Log

PROJECT: Wei Chang Albany, OR

LOCATION: Acid Creek Road

ELEVATION: 701 207.16 Ground 207.7

DRILLING CONTRACTOR: BLS-12

DRILLING METHOD AND EQUIPMENT USED: Corelog 6600

WATER LEVELS: 202.84 12-26-07 START: 10-25-07 END: 10-26-07 LOGGER: C. M. M. M.

DEPTH BELOW SURFACE (FT)				STANDARD PENETRATION TEST RESULTS		CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
INTERVAL (FT)		RECOVERY (FT)	#/TYPE	TEST RESULTS			
				6"-6"-6" (N)			
5	5	2'	C1	11.4	SPV	Asphalt 0-2 Gravelly clay, sandy, 2-3% moisture, 20-30% sand, 70-80% clay, 20-30% silt, 20-30% gravel, 20-30% sand, 20-30% silt, 20	

6" dia. Plastic
10" dia. Plastic



348339 07. C. FS

711W4

SHEET 1 OF 1

Monitor Well Geologic Log

LOGGER: S. M. K. L.

26



348339. 07. C3. FS

TMWS

SHEET 1 OF 1


Monitor Well Geologic Log

LOCATION: *Acid Contained*

DRILLING METHOD AND EQUIPMENT USED :

Genre 6600

WATER LEVELS: 202.69 12.70.07 START: 10/22/07 1345 END: 10/22/07 LOGGER: S. McPhee

DEPTH BELOW SURFACE (FT)				STANDARD		CORE DESCRIPTION		COMMENTS	
INTERVAL (FT)				PENETRATION		SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.	
RECOVERY (FT)				TEST RESULTS					
#/TYPE				6"-6'-6"-6" (N)					
0	0			P.10 (ft)	GM	A-1-A-1 (0-2')			 <p>Flush Mount Morris Vault with 2 Ply</p>
5	5	1.7'	C1	0 (ft)	ML	C1 (0-1.7')			
10	10	4.0'	C2	0 (ft)	GM	Wood (0-6.5')			
15	15	4.0'	C3	0 (ft)	ML	SAND (10-12.5')			
20	20			0 (ft)	GM	SILTSTONE (14-15')			

1345 Sculp
428 Red P.



Technical Memorandum

To: Noel Mak, ATI Metals

From: Jake Gorski, EIT, GSI Water Solutions, Inc.
Randy Pratt, PE, GSI Water Solutions, Inc.

Date: January 6, 2016

Re: Soil Treatability Study; Persulfate Reduction of TCA and TCE in Acid Sump Soils

Purpose and Scope

This technical memorandum provides an overview of a soil treatability study completed for the ATI Wah Chang (Wah Chang), Albany, Oregon, facility (Site) conducted between October 23 and November 11, 2015. The study was used to determine removal rates of trichloroethane (TCA) and trichloroethene (TCE) in bench scale tests that mimic an unmixed 2-foot-deep soil treatment pile. Results of the study will be used in designing the specifications for the soil treatment pile to be used in the planned Acid Sump Source Area excavation project.

Soil for the treatability study was collected from three investigation boreholes in the Acid Sump excavation area on August 3, 2015. Samples also were collected to assess the soil oxidant demand. Results of that analysis are presented in Table 2-1 of the Acid Sump Source Area Remedial Action Plan (Remedial Action Plan; GSI, 2016). Based on the results of the soil oxidant demand analysis, three different treatment options were selected for the soil treatability study:

- Drying soils without the addition of activated sodium persulfate.
- Drying soils with the addition of persulfate at a rate of 2 grams (g) per kilogram (kg) of soil.
- Drying soils and adding persulfate at a rate of 2g/kg.

This technical memorandum discusses how the results of the soil treatability study were used to determine an effective design for managing the contaminated soils from the Acid Sump excavation area.

Soil Sampling

Source Area Soil Collection and Analysis

Three soil borings were completed at the Site on August 3, 2015, with a sonic drill rig that collected continuous core soil samples to a depth of approximately 15 feet. The borings were advanced in the northwest, southwest, and southeast corners of the Acid Sump excavation area (see Figure 2-1). Samples were collected to characterize the concentration of chlorinated volatile organic compounds (CVOC) found in the soil and to provide material for the soil treatability study. The analytical results are discussed in Section 5.6 of the Remedial Action Plan. TCA concentrations ranged from 10 to 26,000 micrograms per kg ($\mu\text{g}/\text{kg}$) while TCE was detected in one of the nine soil samples at $6.6 \mu\text{g}/\text{kg}$ (see Table B-1). The average design concentration for CVOCs in the soil treatment pile was set at $5,000 \mu\text{g}/\text{kg}$ after applying a safety factor of 1.5 to the average observed concentration value observed in the boreholes (see Section 5.6 of the Remedial Action Plan).

Treatability Methodology

Soil samples for the treatability study from each borehole were placed into sealed 2-gallon buckets and delivered to APEX Laboratories in Portland, Oregon. Soils were broken up and uniformly composited; gravels larger than 3/8 inch were removed. Because the soils samples were collected from the Acid Sump excavation area, they are representative in terms of grain size, cohesiveness, moisture content, and geochemical composition to those soils that will be treated in the Acid Sump excavation treatment pile. The soil samples were placed in a single large mixing bowl before spiking them with TCA and TCE. When spiking the soils, efforts were made to not increase the moisture content of the soils above those values that typically might be expected in an outdoor soil treatment pile.

Spiked soils were separated into three containers and target persulfate concentrations were added; zero g/kg into first vessel, 2g/kg into the second vessel, and 4g/kg into the third vessel. Soils then were placed into three uncovered 6-inch-diameter pipes to a depth of about 2 feet. Treatment vessels, or microcosms, had sampling ports at the top, middle, and bottom of the pipe so that the degree of treatment could be measured throughout the depth of the soil profile. After placing the soils into the three different microcosms, time zero samples were collected from the top and bottom of the pipes. Table B-2 shows the initial concentrations recorded at the beginning of the test on October 27, 2015. The goal of the CVOC spiking was to initiate the tests with concentrations approximating the $5,000 \mu\text{g}/\text{kg}$ design value for the excavation soil treatment pile. Some differences in initial concentrations most likely occurred because of the additional mixing time required to distribute the persulfate into the soil versus the microcosm with no persulfate added.

Results

Table B-2 shows concentrations of TCA and TCE over time at the top and bottom of the microcosms with persulfate concentrations of zero g/kg, 2 g/kg, and 4 g/kg. Figure B-1 shows percent reductions of TCA and TCE over time at the top and bottom of the soil treatment pile microcosm with three different treatment options.

Table B-2 shows that initial time zero concentrations vary for different persulfate concentrations, with time zero TCA and TCE being the highest in the microcosm without the addition of persulfate, followed by the 4 g/kg microcosm and the 2 g/kg microcosm. The focus of the soil treatability study was to establish CVOC reduction rates over time with and without the addition of chemical oxidant. The different initial CVOC concentrations are not significant to making that determination.

Table B-2 and Figure B-1 show that TCE volatilizes somewhat more quickly than TCA, and that contaminant concentrations are reduced more quickly from the top of the pile for both compounds. The majority of reduction in TCA and TCE occurred between 2 and 4 days after the initiation of the test and higher persulfate concentrations correlated to faster and more complete contaminant removal. Higher persulfate concentrations were notably better at removing TCA and TCE at the bottom of the soil treatment pile microcosm where soils were not exposed to the air.

The soil treatability study indicates that mixing and the addition of persulfate will be effective in treating design concentrations of CVOCs in excavation soils. The rate of CVOC reduction will be dependent on thorough mixing of the chemical oxidant and soils in the treatment pile as a whole. The only soil treatment microcosm with relatively high concentrations of CVOCs after 14 days was the unmixed soil from the bottom of the pile that has no persulfate added; 1,430 µg/kg for TCA and 798 µg/kg for TCE. With 2g/kg persulfate, these concentrations dropped to 206 µg/kg for TCA and 36.3 µg/kg for TCE.

Conclusions and Recommendation

The soil treatability study demonstrates that much of the reduction in TCA and TCE concentrations occurs during the initial 2 to 4 days. Actual TCA and TCE concentrations in excavation soils as a whole are expected to be lower than the initial spike concentrations in this study. Careful and thorough mixing of the pile with 2 to 4g/kg of persulfate should reduce CVOC concentrations below target treatment concentrations in a 14-day treatment period designed for the project.

Table B-1. Soil Treatability Study
ATI Wah Chang; Albany, Oregon

**TCA and TCE Concentrations
 in Predesign Boreholes**

August 3, 2015

Borehole Location	Sample Depth Interval (feet)	1,1,1-Trichloroethane Soil Concentration (µg/kg)	1,1,1-Trichloroethene Soil Concentration (µg/kg)
NW Corner of Excavation	0-8	470	ND
	8-11	1800	ND
	11-14	26000	ND
SW Corner of Excavation	0-7.5	540	ND
	7.5-10	46	ND
	14-16	21	ND
SE Corner of Excavation	0-5	10	ND
	9-12	730	6.6
	12-15.5	100	ND

Notes:

TCA = 1,1,1- trichloroethane

TCE = 1,1,1-trichloroethene

µg = microgram

kg = kilogram

NW = northwest

SW = southwest

SE = southeast

Table B-2. Soil Treatability Study
ATI Wah Chang; Albany, Oregon

**TCA and TCE Concentration Reductions over Time
 with Varying Concentrations of Activated Sodium Persulphate**

Persulfate	None		2 g/kg		4 g/kg	
Sample Location	Top of Pile	Bottom of Pile	Top of Pile	Bottom of Pile	Top of Pile	Bottom of Pile
TCA Concentrations Over Time (µg/kg)						
10-27-15	12900	17100	3040	3900	5320	4570
10-30-15	2150	2540	419	911	752	1170
11-2-15	883	2940	194	759	238	373
11-4-15	457	2410	353	457	101	359
11-6-15	523	2080	267	282	122	328
11-10-15	105	1430	163	206	<59.5	201
TCE Concentrations Over Time (µg/kg)						
10-27-15	7250	9760	1910	2220	2880	2630
10-30-15	1540	1830	125	248	91.7	178
11-2-15	578	1700	64.9	120	30	30
11-4-15	324	1400	78	76.5	<28.2	27.3
11-6-15	309	1110	54.3	43.3	<30.5	23.6
11-10-15	84.7	768	39.2	36.3	<59.5	<20.1

Notes:

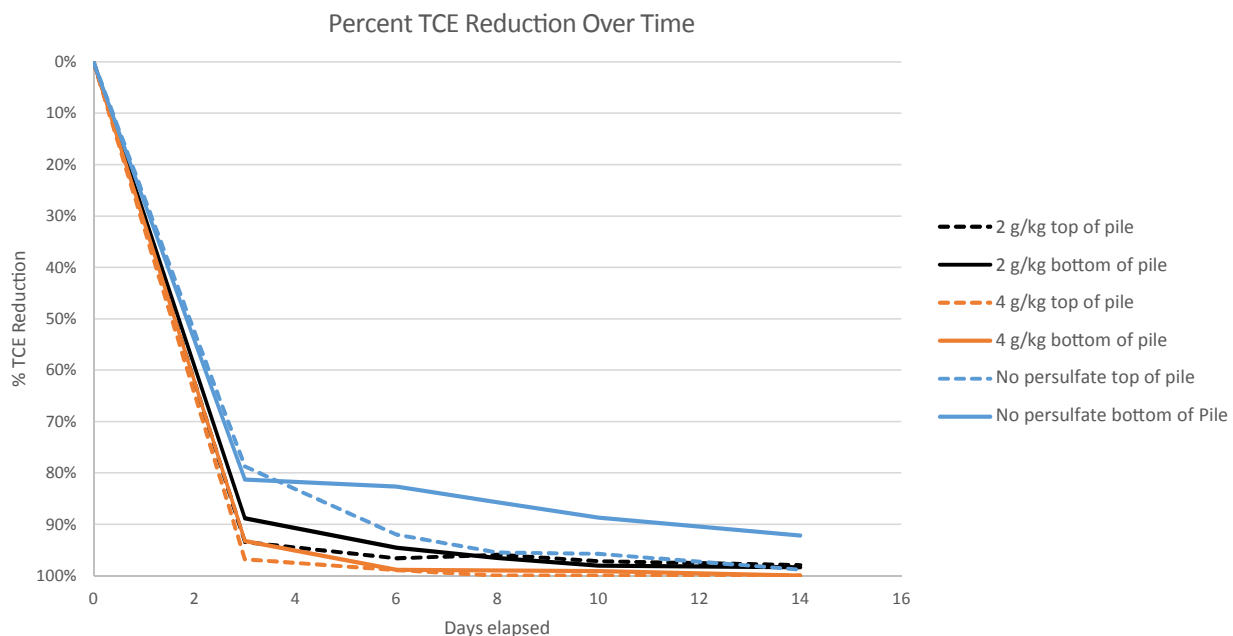
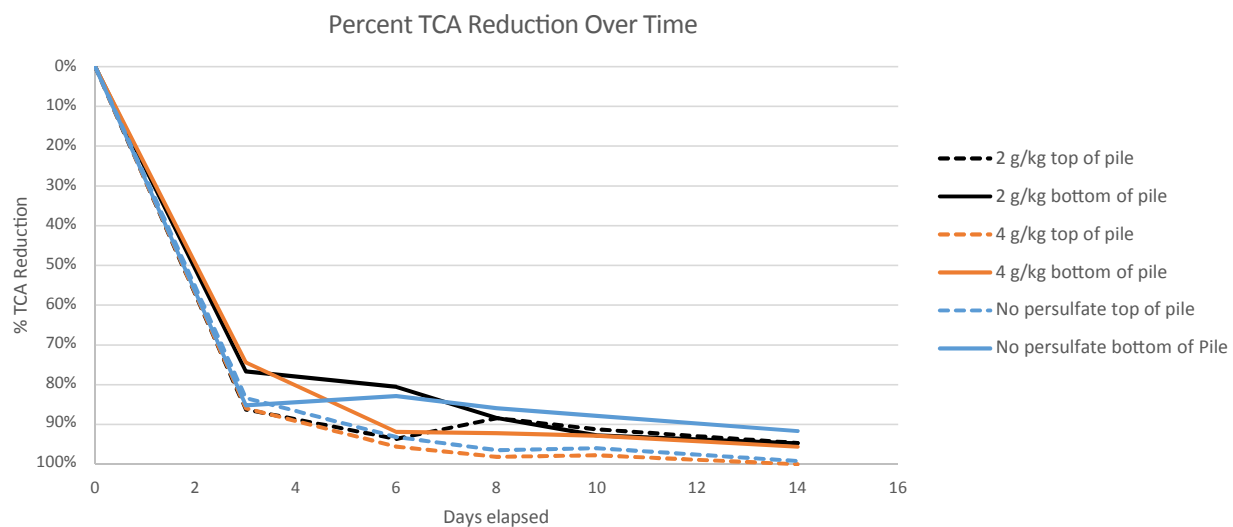
TCA = 1,1,1-trichloroethane

TCE = 1,1,1-trichloroethene

g = grams

kg = kilograms

µg = micrograms



NOTES:

TCA = 1,1,1-trichloroethane
TCE = 1,1,1-trichloroethene
g = gram
kg = kilogram
Oxidant = activated sodium persulfate

FIGURE B-1
TCA and TCE Reduction in Acid Sump Soils after Treatment with Persulfate

Soil Treatment Study
ATI Wah Chang - Albany



Appendix C
Groundwater Component Specifications and CVOC Removal Efficiency

LO-PRO III

Low Profile Air Stripper

Installation and Operation Manual

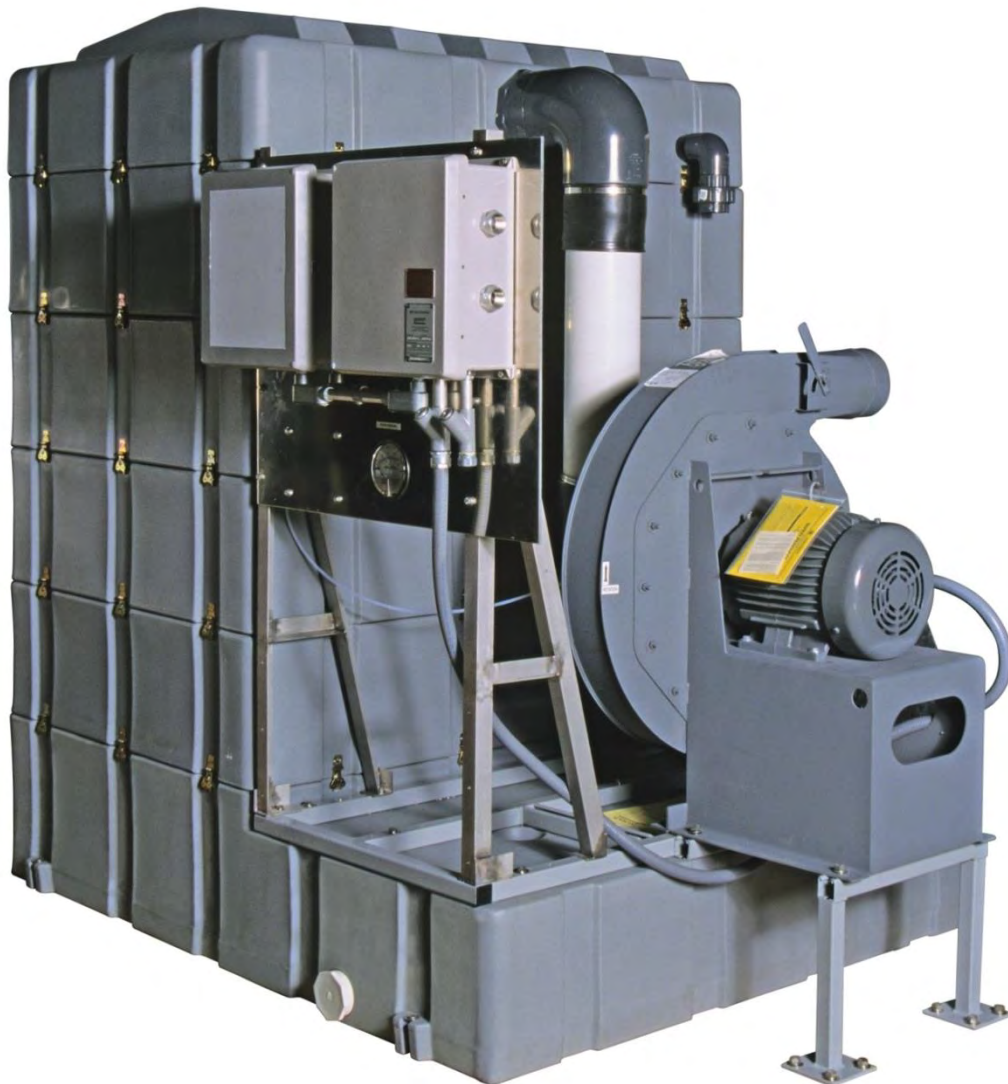


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DOCUMENTATION CONVENTIONS

This document uses the following conventions to present information:



WARNING

An exclamation point icon indicates a **WARNING** of a situation or condition that could lead to personal injury or death. You should not proceed until you read and thoroughly understand the **WARNING** message.



CAUTION

A raised hand icon indicates **CAUTION** information that relates to a situation or condition that could lead to equipment malfunction or damage. You should not proceed until you read and thoroughly understand the **CAUTION** message.



NOTE

A note icon indicates **NOTE** information. Notes provide additional or supplementary information about an activity or concept.

Section 1: System Description

Function and Theory

The Low Profile Air Stripper III (LO-PRO III) is a cost-effective, modular system designed for the efficient removal of volatile organic compounds from groundwater. The LO-PRO III is compact and unobtrusive and can be discreetly integrated into any site landscape. The modular construction of the system makes it easily adaptable to changing conditions and requirements. By simply adding or subtracting aeration trays, the LO-PRO III can be fine-tuned for different influent concentrations and removal efficiencies. Figure 1-1 shows a standard three-tray system. Figure 1-2 is an example of a LO-PRO III system with optional equipment components.

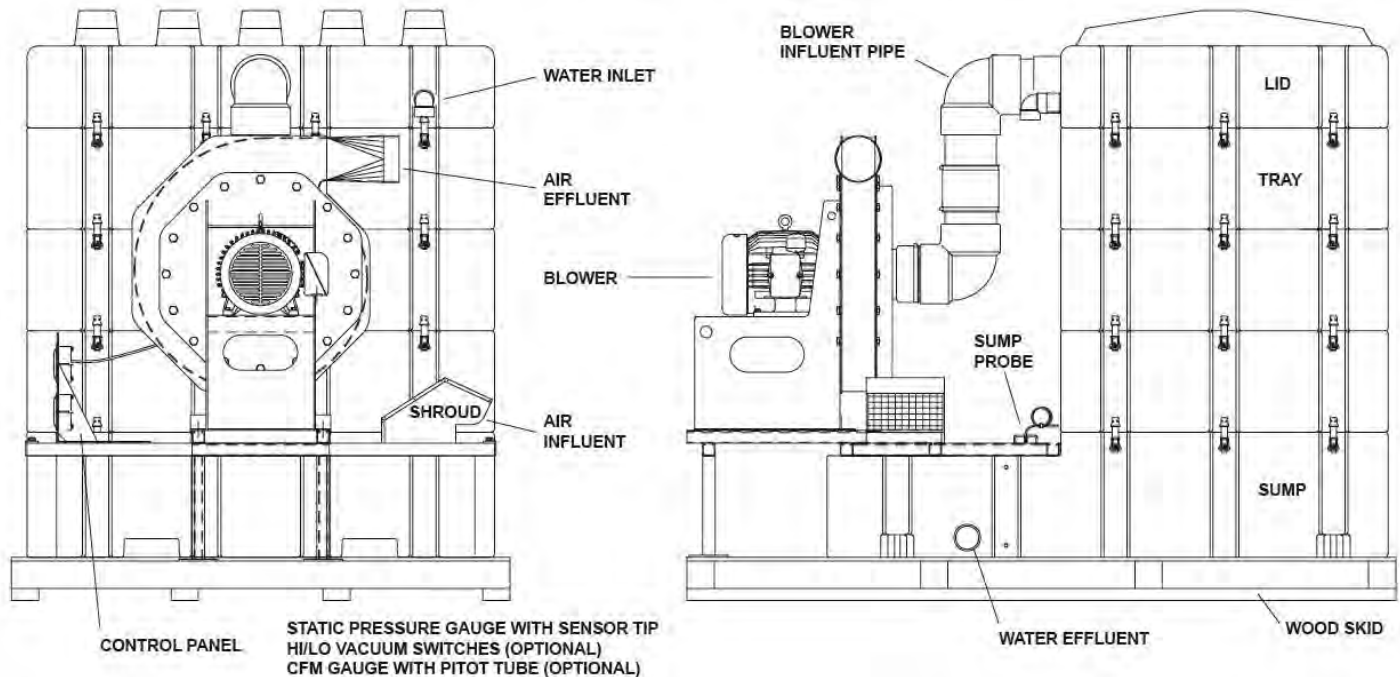


Figure 1-1 – Example of a LO-PRO III with five trays.

The standard LO-PRO III system consists of a 187 gallon (708 liter) sump with integral floor mounts, three to five aeration trays with integral gaskets and latches, a lid (cover) with mist eliminator, a 10HP blower, and a static pressure gauge. Each aeration tray consists of an alternating, stainless steel bubble plate with attached downcomer for funneling water. The sump, trays and lid are constructed of low density polyethylene. PVC pipe is used for all external plumbing and fittings. Refer to Section 8 for a list of parts and optional equipment. See Section 4 for more information on unit maintenance and tray orientation.



Sump capacity is based approximately on the dimensions of the sump to the height of the water HI OVERRIDE switch (blue float) of the sump probe. When activated the HI OVERRIDE switch will shut off the influent water pump, preventing the sump from over-flowing. During normal operation, the HI LEVEL switch (orange float) will turn on the effluent transfer pump and empty the sump (of approximately 75 gallons or 284 liters) or until the LO LEVEL switch on the probe is reached. See also the probe diagram in Figure 1-5.

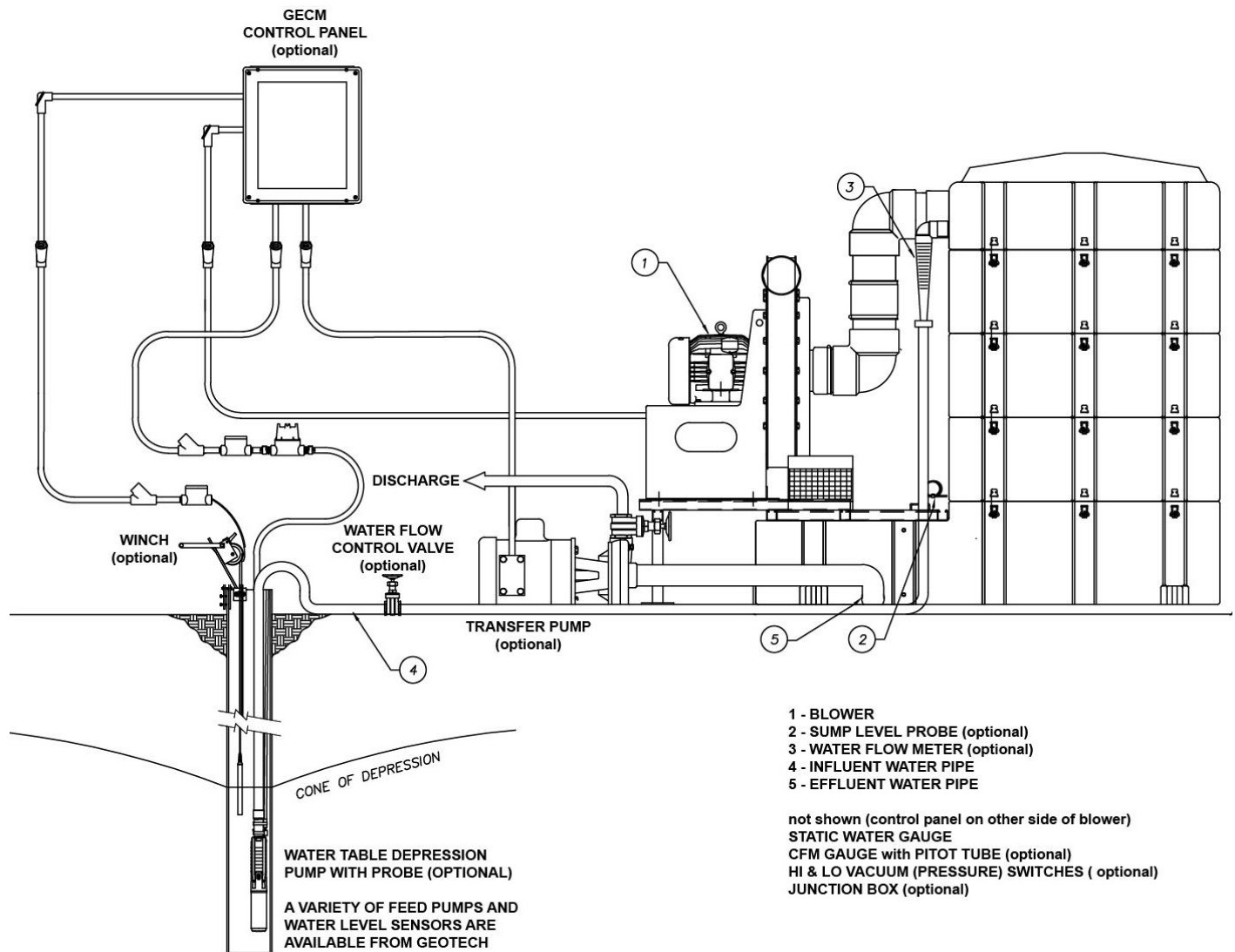


Figure 1-2 - LO-PRO III system deployed with optional GECM Control Panel, Transfer Pump and Water Table Depression Pump.

The LO-PRO III(S) System

The LO-PRO IIIS is a freestanding, integrated system designed to operate under the rigorous demands of continuous duty air stripping, but requiring minimal installation and field wiring. Operation of LO-PRO IIIS components is controlled with an optional GECM Control Panel at the remediation site, which can also allow remote monitoring of site activity.

The LO-PRO IIIS utilizes most of the equipment options offered by Geotech. Pre-wired and plumbed equipment includes a panel stand that supports the GECM Control Panel, which contains the system motor starters, protection circuits, and vacuum control accessories. The GECM is also designed to control the effluent transfer pump with input from the sump level probe, as well as the influent pumps and probes when configured accordingly.

Theory of Operation

All air stripping systems take advantage of the fact that many hydrocarbon contaminants such as benzene, toluene and xylene can be volatilized when exposed to an air stream. These systems work by maximizing contact between air and the contaminated water to be treated causing the molecules of volatile contaminants to diffuse from the water into the air, which is then carried away.

Removal Efficiency

Removal efficiency is the difference in contamination level between the influent and effluent water streams. This difference is usually expressed as a percent.

For example, when the influent concentration of BTEX is 3000 ppb (parts per billion) and the effluent concentration is 3 ppb, the removal efficiency for BTEX is 99.9%. Removal efficiency is determined by two major system parameters; air/water ratio and water residence time.

Air/Water Ratio

Air/water ratio is the volume of air being pulled through the system per volume of water being treated. In practical terms, the air/water ratio is the CFM/CMM generated by the blower divided by the influent water flow rate in CFM/(GPM x .1337) or CMM/(LPM x 17.92). Looked at in another way, the air/water ratio is a measure of the amount of contact that takes place between air and water at any one moment in time.

Residence Time

Residence time is the length of time a given water molecule remains in the system from the time it enters the top of the air stripper until it falls into the sump. The longer the residence time the greater the potential for removal of volatile contaminants. In conventional packed tower air strippers, residence time is determined by the height of the tower and the water flow rate. In bubble plate air strippers like the LO-PRO III, residence time is a function of flow rate and the number of trays being used.

Multiplying the air/water ratio by residence time gives a measure of removal efficiency or the total amount of aeration experienced by a molecule of contaminated water as it passes through the system.

Packed Towers

In conventional packed tower air strippers, contaminated water cascades down through a tower filled with packing medium that exposes large surface areas of the water to an up pushing air stream. To obtain high removal efficiencies from such systems, packed towers as tall as 30 ft. (9 m) or 40 ft. (12 m) are sometimes required. This is because water residence time per unit packed towers is quite brief. Towers must therefore be tall to allow time for adequate stripping of contaminants.

In contrast, the LO-PRO III Air Stripper uses a unique multi-stage counter-flow aeration system that requires no packing medium and yields removal efficiencies of up to 99.99% from a unit that stands less than nine feet high from top to bottom.

Figure 1-3 contains an example of the flow of air and water within the LO-PRO III system.

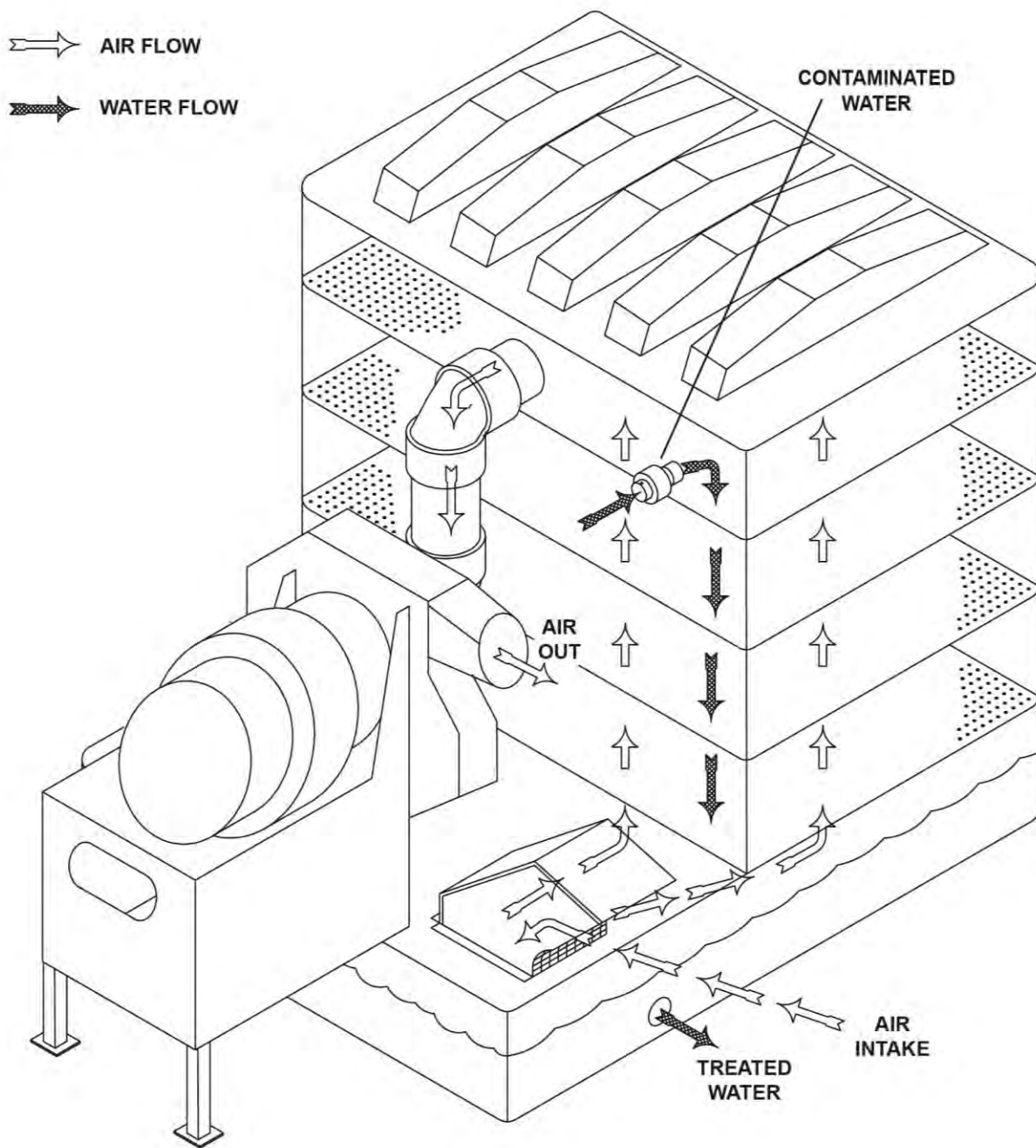


Figure 1-3 - Process Flow Diagram of the LO-PRO III Air Stripper.

Contaminated water enters the LO-PRO III at the top and slowly cascades down from tray to tray. While in each tray, the water is aerated by bubbles generated by the bubble plates mounted and sealed between each tray. The multi-stage counter flow design permits long water residence times and high efficiency stripping without the need for a tall packed tower.

System Components

Blower

The standard LO-PRO III uses a centrifugal blower to draw air through the bubble plates. The blower is mounted on a steel metal frame that also supports optional panels containing the following instrumentation: a standard Static Pressure Gauge, the optional HI and LO Vacuum (Pressure) Switches, and the optional CFM Gauge with filter. Explosion proof blowers are available for use in Class 1, Div. 1, Group C & D hazardous locations.



The optional GECM Control Panel is equipped with thermal overload connections when this feature is provided by the blower manufacturer.

Sump

The sump is 72" (183 cm) long, 60" (152 cm) wide and 16" (41 cm) high and is constructed of low density polyethylene (LDPE). It serves both to collect treated water and to support the aeration trays, blower assembly, and panel stands. Also molded into the exterior of the sump is an intake hole, a hole for the optional sump probe, threaded holes for a sight tube, and threaded holes for NPT fittings to attach water effluent pipe.

Aeration Trays

The trays are constructed of LDPE and are molded for vertical stacking on top of the sump. They are secured to one another and to the sump by quarter turn fasteners. Flexible gaskets on the mating surfaces assure an air and water tight fit between trays. The stainless steel bubble plates are designed to be sandwiched between successive trays. This provides for easy removal efficiencies and can be adjusted by changing the number of trays used with the system. The trays are 42" (107 cm) deep, 60" (152 cm) wide and 13" (33 cm) high.



Alterations to LO-PRO III tray configurations will require changes to the bubble plate orientation and possibly the blower type. Consult with a Geotech Sales representative prior to modifying your existing unit.

Lid (or Cover)

The lid contains the polypropylene mist eliminator and fits on the top of the LO-PRO III unit. Constructed of LDPE, the cover is equipped with fittings for attachment of the influent water and effluent air plumbing.

Static Pressure Gauge

A static pressure gauge is provided to measure the difference between ambient air pressure and the pressure generated inside the system. The gauge reads in inches of water column and is connected by FEP tubing to a static sensor tip mounted in the blower influent air pipe.

Optional Components

Although the standard LO-PRO III can be plumbed, wired and operated as delivered, the benefits of the system can be greatly enhanced by the addition of the optional accessories described in the following pages. Figure 1-2 shows a typical water treatment installation using a fully optioned LO-PRO III.

GECM Control Panel

The GECM Control Panel (shown in Figure 1-4) is a microprocessor based controller designed to simultaneously control the LO-PRO III along with an optional transfer pump and/or feed pump. The controller is housed within a weatherproof NEMA 4 (IP 66) enclosure and incorporates circuitry to receive sensor input from optional vacuum switches and sump probe. The GECM is fully instrumented and includes a display that provides a visual indication of the equipment status.



Figure 1-4 – GECM Control Panel (shown with options)

In addition to coordinating operation of the LO-PRO III blower and its transfer pump or feed pump, the GECM panel can be configured to shut down the blower, water pump or interconnected equipment in the event of an alarm condition affecting any part of the system. For example, if the optional LO Vacuum Switch detects a blower failure, the panel will shut off the feed pump before untreated water can pass through the system.



Because the GECM Control Panel requires sensor input for sump water level and system vacuum, Geotech strongly recommends that the optional sump probe, high vacuum and low vacuum switches be ordered whenever a GECM Control Panel is being used with the LO-PRO III.

In addition, the GECM Control Panel also has connections for blower motor thermals when provided by the manufacturer.

Motor Starters

A variety of motor starter options are available to meet the requirements of the LO-PRO III blower and transfer pump. These components are easily installed to a GECM Control Panel or explosion proof enclosure as needed.

A separate motor starter is assigned to the blower and to the influent and effluent pumps. Motor starters come with an adjustable amp range set point and manual or automatic reset. The control panel is also wired to shut off the motor starter when thermal overload or vacuum switches are provided.

Sump Probe

The LO-PRO III Sump Probe (Figure 1-5) monitors the water level within the sump and provides sensor input to the optional GECM Control Panel.

The probe is density actuated and uses separate floats to control feed and transfer pumps. The bottom float controls operation of the optional transfer pump by actuating HI and LO switches located on the probe shaft (see Figure 1-5). The pump starts when the HI/LO level float rises to the HI switch and continues to run until the water level drops the float to the LO switch. The 4 inch (10 cm) HI/LO range on the probe results approximately to a 75 gallon (284 liter) working sump capacity.

The top float actuates the HI OVERRIDE switch. If the sump should become full, the rising water level will lift this float and shut off the feed pump.

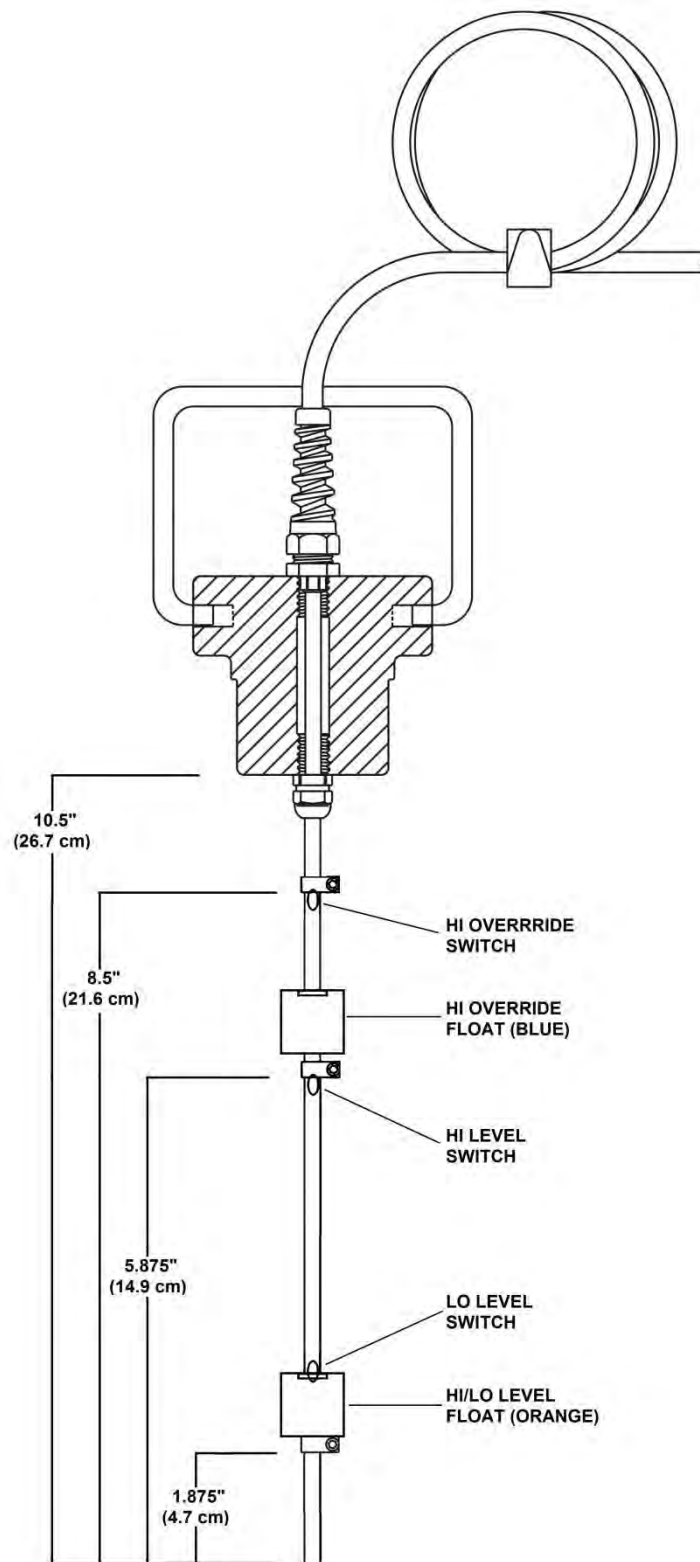


Figure 1-5 - LO-PRO III Sump Probe.

High and Low Vacuum (Negative Pressure) Switches

High (HI) and Low (LO) Vacuum Switches are available to monitor the vacuum generated by the blower. In the event of a blower shutdown, the LO Vacuum switch signals the control panel to shut off the feed pump, thereby preventing untreated water from passing through the system.

If bubble plate fouling or water entrainment causes the vacuum in the system to rise, the preset HI Vacuum switch will signal the control panel to shut off the blower. This will reduce the possibility of water being pulled into the blower. At the same time, the LO Vacuum switch will initiate when the blower stops causing the feed pump to shut down also, thereby preventing untreated water from passing through the system.

HI and LO Vacuum switches are mounted to the lower backside of the black control panel so that they can be easily placed in line with the FEP tubing from the Static Pressure gauge before connecting to the Static Sensor Tip in the influent blower piping. Blue switch cabling will then connect to the optional Junction Box from which connection to a GECM Control Panel or other control source can be made.

See Section 4 for more information on the HI and LO Vacuum switches and their operation.

CFM (Air Flow) Gauge

The optional Cubic Feet per Minute (CFM) gauge, with Pitot tube, air filter and FEP tubing, measures the volume of air passing through the LO-PRO III system. The gauge is equipped with an air filter to prevent moisture from accumulating in the gauge. CFM gauges are matched to the specifications of the blower and LO-PRO assembly. If this option is included, the Pitot tube is factory installed at a specific point along the effluent pipe between the blower and lid to ensure a correct flow reading on the gauge. Consult Geotech Sales when installing a CFM assembly to your system.

Water Flow Meter

An optional water flow meter is available for mounting to the influent water connection on the LO-PRO III lid. The standard flow meter, also known as a rotameter, is a clear plastic flow meter with a weighted float that allows the operator to view water flow rate at the site. Other water flow measurement and monitoring options include flow totalizer with digital display of both gallons pumped and water flow rate; and remote monitoring of totalizer pulses are available and can be included with the GECM Control Panel. Geotech provides partial plumbing on the lid, with a 2" PVC slip fit union, so that a flow meter can be easily attached.

Transfer Pump

Transfer pumps are surface mounted centrifugal pumps designed to move water from the sump of the LO-PRO III to a drain, storm sewer or secondary treatment system. Transfer pumps can also be controlled with the GECM Control Panel. See Figure 1-2 for a diagram of a typical LO-PRO III installation showing feed lines and transfer pump.

Section 2: System Installation



The LO-PRO III must be installed, operated and maintained according to the procedures described in this manual. Failure to follow these procedures or to observe the Warnings and Cautions included in this manual may result in personal injury and will void the Standard Equipment Limited Warranty.



The standard LO-PRO III system is designed for installation and operation in a non-hazardous, non-classified location with intrinsically safe extension into a hazardous classified location. Geotech does not determine classification of a location. Check government regulations regarding hazardous area locations prior to installing your system.

Classification of location is subject to local jurisdiction enforcement of NFPA regulations. All installations should be performed in accordance with the National Electric Code (NEC) Handbook. Before deploying the LO-PRO II, confirm that the electrical service at the site is properly sized for the blower and/or optional GECEM Control Panel, and that it conforms to NEC and local codes.

Unpacking

Unpack the LO-PRO III shipping crates. Depending on the height of the unit, the system components are generally shipped on two separate pallets. One pallet contains the sump with the bottom tray and blower already installed. The sump will be bolted to this pallet prior to shipment. The second pallet will contain the remaining trays and all plumbing.



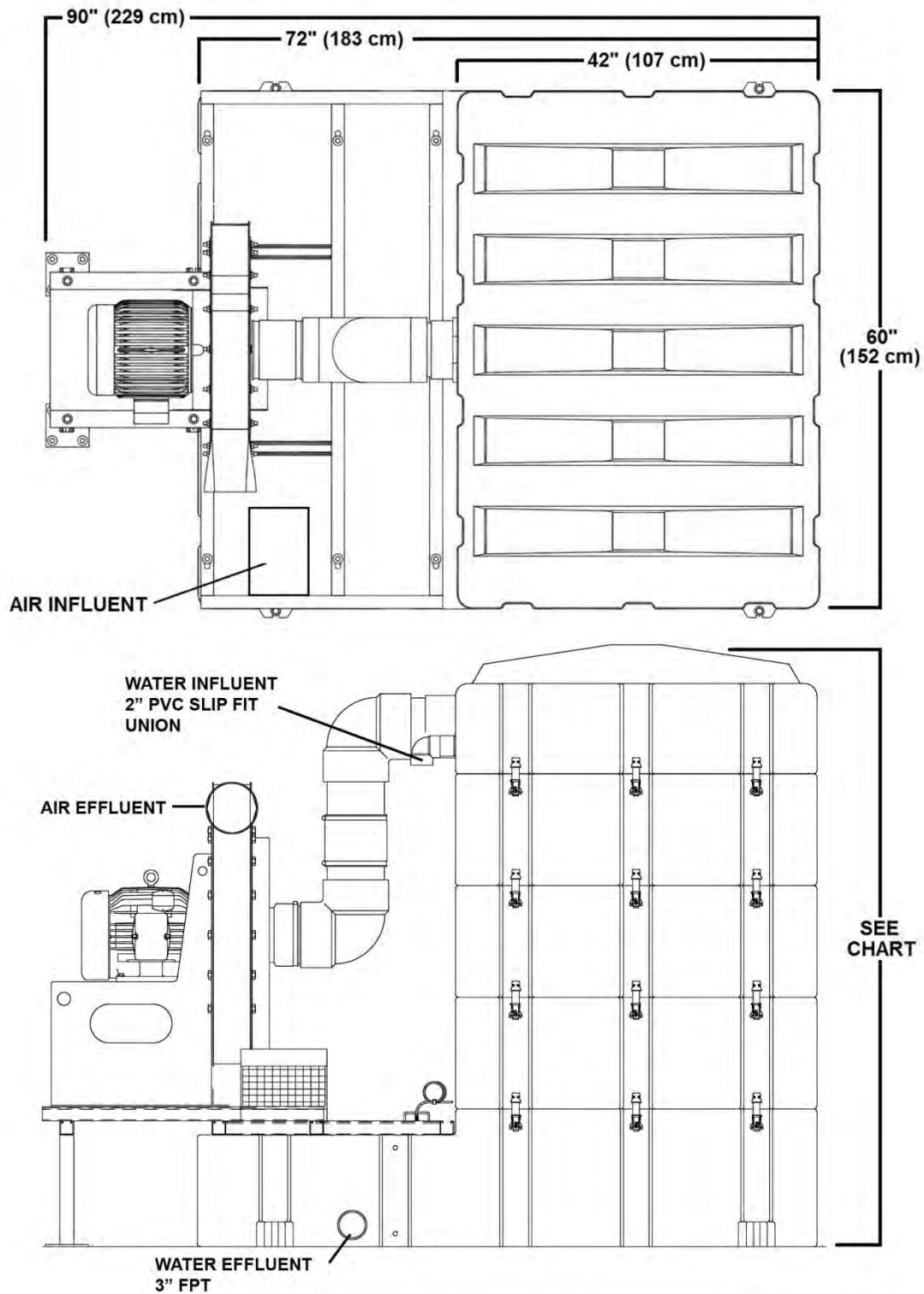
If the total height of the unit with pallet does not exceed the maximum shipping height of the transport truck, then the unit will be shipped completely assembled.

Inspection

Inspect all equipment upon arrival. Check the contents of the packing crates against the Sales Order and the System Specification Sheet included with this manual. If any items are missing or damaged, make note of this on the shipping papers and immediately notify Geotech Environmental Equipment, Inc. in Denver, Colorado, USA at (800) 833-7958 or (303) 320-4764.

Deployment

Throughout the following installation procedures, refer to Figures 1-2 and 2-1, and when applicable, the GECEM Field Wiring Diagram.



TOTAL TRAY STACK HEIGHT				
TRAY QTY.	2	3	4	5
13" (33 CM) TRAYS	57"/145 cm	70"/178 cm	83"/211 cm	96"/244 cm

Figure 2-1 - LO-PRO III plumbing hookup diagram showing system dimensions and influent/effluent fitting locations.

Mount the Sump

Place the shipping pallet with sump on a flat level surface capable of supporting the entire system when filled with water. The filled weight of the sump is approximately 1525 lbs. (693 kg), while each aeration tray weighs approximately 128 lbs. (58 kg) when full. Given the additional weight of the blower and other system components, the total weight of an average 3-tray system is 2100 lbs. (955 kg).



Leveling the sump is important: the LO-PRO III will function properly only if the tray stack is plumb.

Stacking the Trays

The sump will be shipped with the first (bottom) tray (along with bubble plate and downcomer) pre-mounted and properly oriented. Depending on the height of the unit, the system may be completely assembled and ready to go upon arrival.

Carefully record the orientation of the bubble plate that is mounted between the sump and the first tray. Each bubble plate has a transfer duct (or downcomer) attached. The remaining trays are then stacked so that the positioning of these downcomers alternate from one side of the bubble plate to the other. Tray orientation will be correct upon receipt, but it is good to record the orientation should the unit be disassembled for cleaning.

The key to proper tray stacking is as follows: If the unit has an even number of trays (not counting the lid), then the first bubble plate is to be placed with the downcomer towards the front (or blower side) of the unit. If there is an odd number of trays then start the downcomer towards the back by flipping the bubble plate over and re-installing the downcomer.

Trays are to be stacked individually to assure that each bubble plate is centered on top of the tray before placing the next higher tray. Stack the remaining trays and bubble plates on top of the sump and place the lid onto the top tray.

The downcomer openings are to face to the right (as you look at the unit from the blower side). The objective to alternating the downcomers is to evenly distribute the flow of water through the system and to end up with the last bubble plate's downcomer placed towards the back of the unit. When the lid is attached the influent water connection will not pour directly into an open downcomer, bypassing the first bubble plate. (A bubble plate is not installed between the top tray and lid.)

The bubble plate used on the LO-PRO III is universal and can be flipped over to place the downcomer towards the front or back. Because of this trays can be added or removed and the bubble plates re-arranged accordingly. The first downcomer installed to the sump is taller than the rest.

Ensure all trays are aligned before locking the clamps in place.

Install the Lid

Verify that the water catch basis is secured to the front, right side of the last tray with two screws. The basis is for catching the influent water stream. Verify that the internal plumbing on the lid is set at 45 degrees to the outside (or towards the water catch basin) when the lid is in place. The mist eliminator will already be strapped to the lid from the factory. Ensure the lid is aligned to the top tray before locking the clamps in place.

Install Plumbing

1. If not connected, install the blower influent pipe between the 3" unions on the lid and blower.
2. Connect the influent water line and optional flow meter to the 2" slip fit union on the lid.
3. Run an effluent water pipe from the sump to a suitable receptacle or to a transfer pump for discharge to another location. Two 3" FPT ports are provided on the sump for attachment of an effluent water pipe. These ports are located on opposite sides of the sump. Check local codes before plumbing effluent pipe.

Air Intake

The LO-PRO III comes with a screened air intake shroud. A mating flange can be installed when necessary to run ducting to an external air source.

Connect Exhaust

Make any necessary exhaust connection to the fan "Air Out" opening on the blower. Route exhaust air to a separate collector or as required by local codes.

Wiring



All wiring must be carried out by a qualified electrician and be in accordance with government codes.

Wire Blower

The LO-PRO III is normally equipped with a 10HP, TEFC, 230/460 VAC, 3 phase blower. The blower can be wired directly to a local power source it can be operated and controlled with the optional GECM Control Panel.



When the blower is wired directly to a local power source, thermal overload protection (when accompanying the blower electrical) needs to be properly wired to the motor starter by a qualified electrician.

Because each GECM is unique to the system(s) they operate, Geotech provides the customer with a GECM Field Wiring Diagram showing all wiring connections between the GECM and the system. The GECM panel is equipped with latching overload protection that will prevent the blower motor from restarting until the panel control switch is manually reset.

Wire Sump Probe & Vacuum Switches (optional)

If your LO-PRO III is equipped with the optional sump probe and HI/LO vacuum switches, the leads from these components will be wired into a junction box mounted to the system control panel. The customer must wire from the junction box to the control panel (Figure 2-3) or as shown in the GECM Manual or GECM Field Wiring Diagram. Figure 2-4 shows an example of the interior of a standard LO-PRO III junction box.

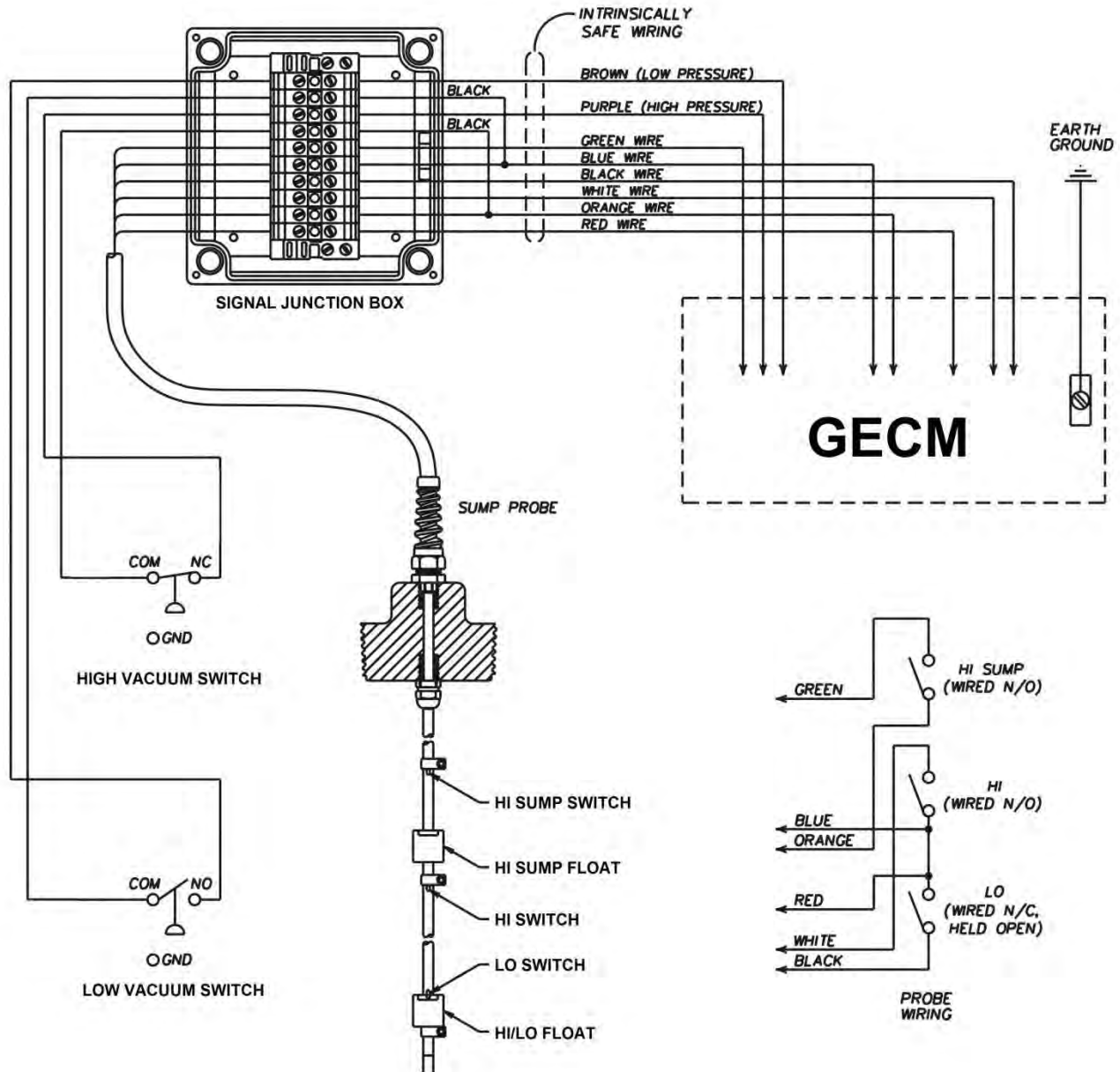


Figure 2-3 - Wiring Diagram for the LO-PRO III sump probe and HI/LO vacuum switches. Refer to the GECM Manual or GECM Field Wiring Diagram for connections to the GECM Control Panel.

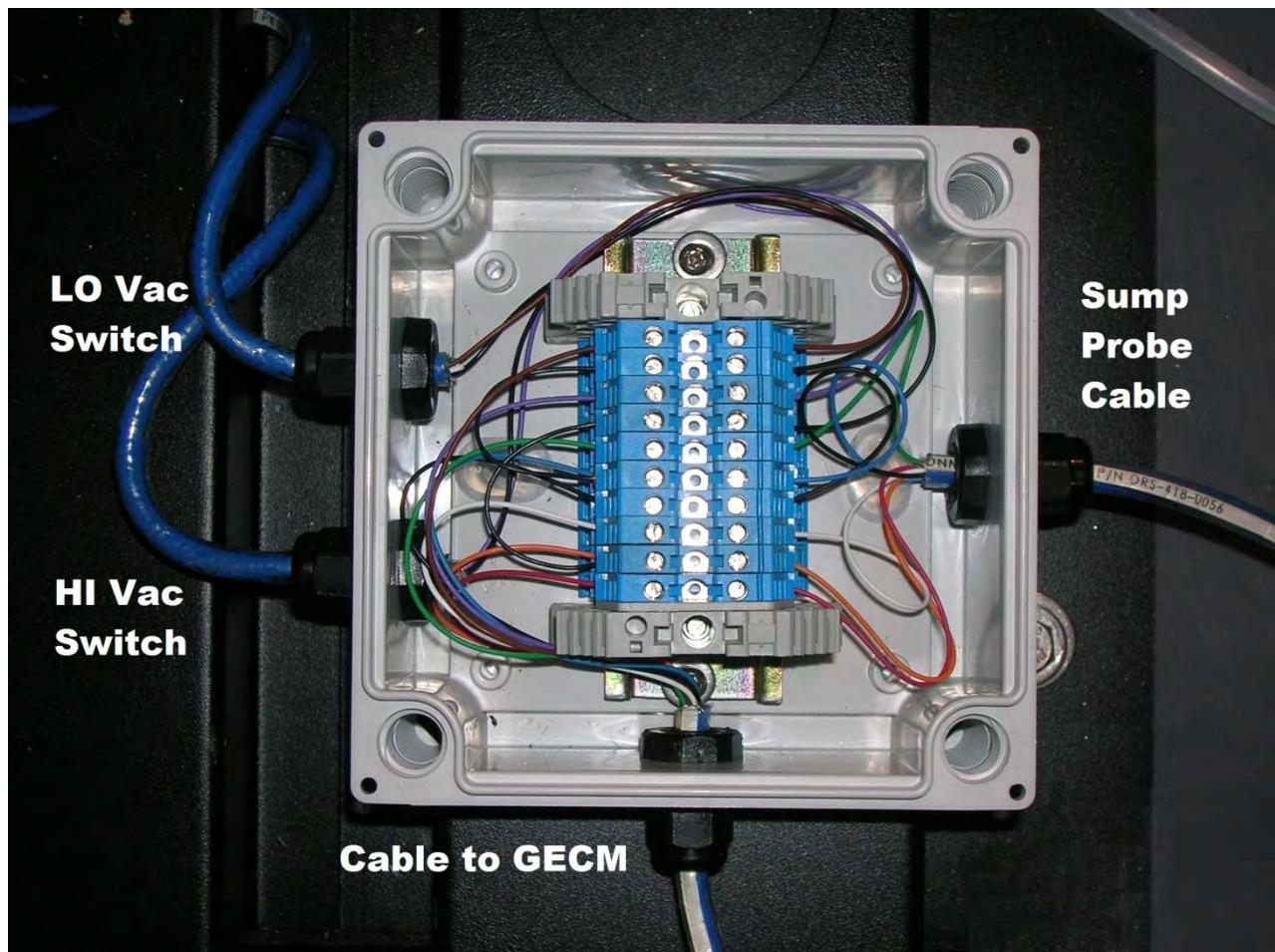


Figure 2-4 - LO-PRO III junction box with HI/LO Vacuum switch and sump probe wiring plus cable connection to optional GECM Control Panel.

Connect CFM Gauge (optional)

If your system is equipped with the optional CFM gauge, use the flexible FEP tubing provided to connect the gauge to the Pitot tube. Both the gauge and the Pitot tube are equipped with push-in fittings. When cutting and fitting the flexible tubes, ensure that they are not cut so short as to cause binding or kinking. Tubing should gently hang between both points and away from the blower body.



The tubing must be installed as shown in Figure 2-5.

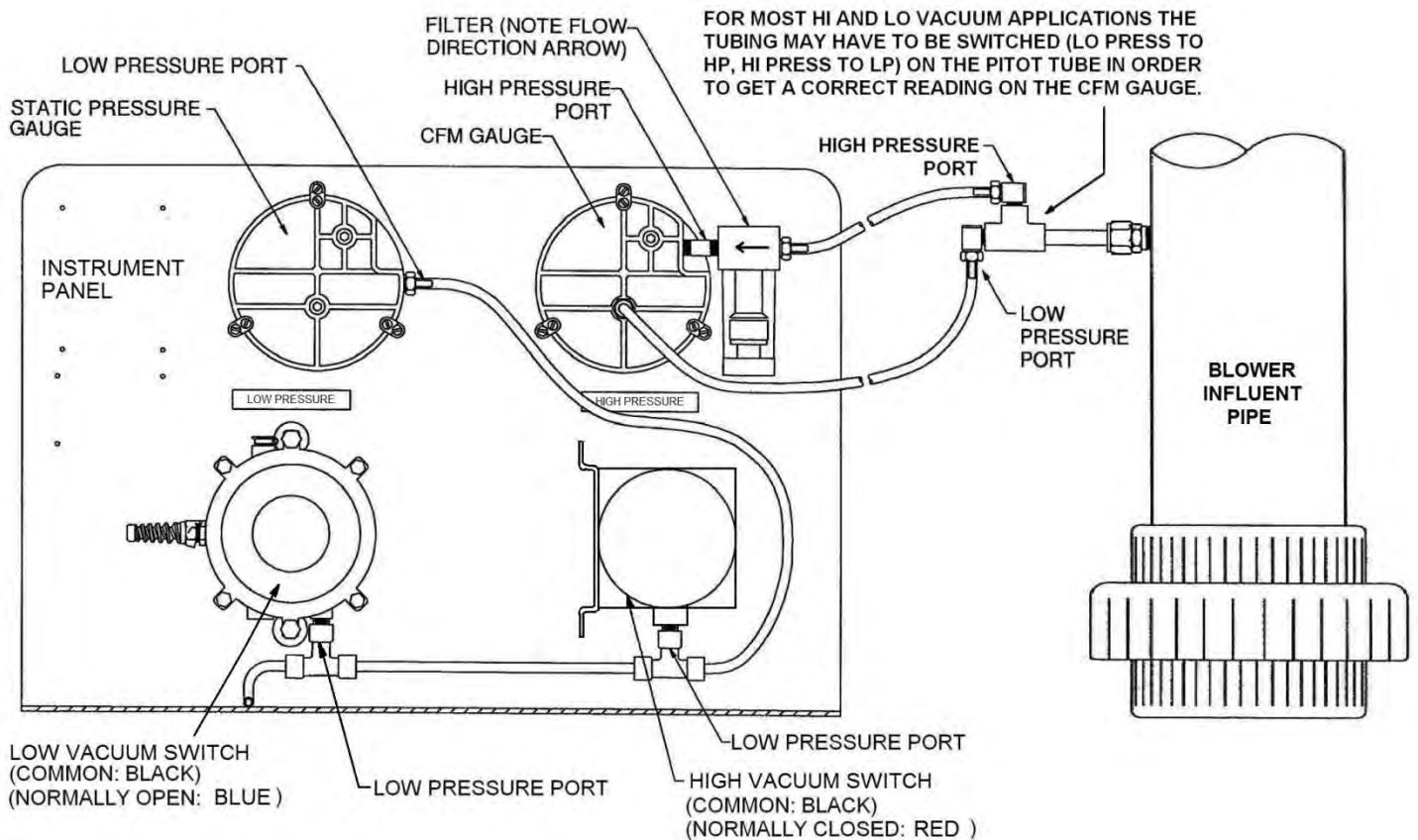


Figure 2-5 – Air lines and Pitot tube connection to the CFM gauge.



Not all CFM gauges are designed to work with all Pitot tubes. Readings can be off when mismatched. Consult Geotech for the correct application. Tubing connections between the CFM gauge and Pitot tube may need to be reversed for proper function. Ensure that both levers on the Pitot tube are open.

Install Flow Meter (optional)

If your system includes a flow meter, it must be installed in-line with the influent water source and in a vertical plane to ensure accuracy. Thread tape all fittings and hand tighten the connections. Over tightening can crack the flow meter.

Install Transfer Pump (optional)

To install a transfer pump with the LO-PRO III, refer to the separate GECM Field Wiring Diagram and to the paperwork provided with the transfer pump. Refer to Figure 1-2 for an example of a LO-PRO III installed with a transfer pump. Effluent connections at the pump can be made off the valve assembly at the top of the transfer pump. Plumbing considerations are dependent upon the site configuration.

Section 3: System Operation

Startup

Once installation has been completed the LO-PRO III is ready for startup. Proceed as follows:

1. Double check all electrical and plumbing connections.
2. Close the water flow control valve (if present).
3. Start blower and check air flow direction (blower rotation). If using three phase power a qualified electrician will need to adjust the leads.
4. With the water flow control valve slightly open, start the feed pump. Slowly open the water flow control valve until the desired flow rate is obtained.
5. Adjust the blower discharge blast gate so as to regulate the system current to the appropriate nameplate stated amps for the voltage.



If you are using a transfer pump and GECM, turn the control switch to AUTO before starting the feed pump. The transfer pump, in conjunction with the sump probe, will start when sufficient processed water has accumulated in the LO-PRO III sump.

Operation

Once startup has been achieved, LO-PRO III systems equipped with the optional GECM Control Panel, sump probe and vacuum switches will function as shown in the system Process & Instrumentation Diagram (Figure 7-1).

- Secure blower blast gate position with the wing screw to insure the appropriate amp draw at startup.
- Record system static pressure at startup obtained from included static pressure gauge.

Sump Probe

The optional controls enhance the efficiency and safety of the LO-PRO III system by coordinating the function of the blower, the feed pump and the transfer pump.

The sump probe monitors the water level in the LO-PRO III sump and signals the transfer pump (via the control panel) to switch the pump on and off in response to changes in water level. The probe also has a HI-OVERRIDE sensor that can shut off the feed pump if the water level in the sump rises too high and threatens to flood the blower.

High Vacuum (Pressure) Switch

If bubble plate fouling or water buildup in the trays causes the total system vacuum to rise over a predetermined limit (approx. 30" (7.5 kPa) of water column for 10HP blowers and 35" (8.7 kPa) for 15HP blowers), the HI Vacuum switch will shut off the blower. This will prevent water from reaching the blower.

Low Vacuum (Pressure) Switch

Should the LO-PRO III experience a power failure to the blower or have part of the vacuum tubing line cut, the system pressure will automatically fall below 1" (.3 kPa) to 2" (.5 kPa) of water column and the LO Vacuum switch will shut off the LO-PRO III control panel and feed pump. This will prevent untreated water from passing through the LO-PRO III system.

To restart the blower after it has been shut down by a LO or HI Vacuum condition, remedy the cause of the shutdown then turn the HOA switches for the blower and transfer pump on the GECM to OFF. Press the RESET button to clear the error then turn both switches back to AUTO.



If water intrusion into the blower piping is suspected, remove the effluent 6" pipe at the blower and empty the piping of all water before starting the blower.

Blast Gate

The provided blast gate, located on the discharge side of the blower, is factory set to provide the appropriate amps of motor current with the dry systems. Geotech recommends resetting the blast gate to achieve the appropriate amps at the particular site of operation with water flowing through the system.



The amps will increase as the blast gate is opened. To avoid over-amping your system, always start with the gate half open. While using an amp probe on a power leg at the motor, adjust the gate for optimum air flow (30"/7.5 kPa for 10HP, 35"/8.7 kPa for 15HP) while monitoring the amps. Lock the blast gate in place after every adjustment.

Section 4: System Maintenance

Cleaning the LO-PRO III Unit

The LO-PRO III is designed for trouble free operation with minimal maintenance required. The modular design of the system permits easy disassembly for inspection and cleaning.



Material removed from the LO-PRO III bubble plates during cleaning should be collected and disposed of in accordance with government codes. It is the customer's responsibility to determine if minerals deposited by the groundwater must be treated as hazardous waste.



Always wear eye protection, gloves and proper clothing when performing maintenance procedures. Geotech recommends that the appropriate personal protective equipment for cleaning LO-PRO III trays should be at USEPA Level D Protection modified with splash protection as follows:

Hard hat with splash shield
Splashguard goggles
Waterproof coveralls
Waterproof gloves
Waterproof boots

At sites where toxic chemicals are present in the water being treated, upgraded Personal Protective Equipment (PPE) (e.g. air purifying respirator, chemical resistant gloves, etc.) may be required.

Sump, Tray and Lid Cleaning Procedure



When performing regular maintenance, be careful not to damage the gaskets by placing or sliding the lid or trays on the ground or rough surface. A set of gaskets is glued to each tray and should be cleaned separately with a soft cloth. Replacement gasket kits can be obtained from Geotech.

The most common maintenance that may be needed on a regular basis will be the cleaning of the bubble plates. If the holes in the bubble plates begin to clog due to buildup of organic or inorganic material in the water, the HI Vacuum switch will repeatedly shut down the system. When this happens, it is recommended that the aeration trays, bubble plates and downcomers be disassembled and cleaned as follows:

1. Numerically mark the outside of the trays so that re-assembly will be easy. Do this for each bubble plate also so that the orientation can be properly restored when reassembled. When necessary, use the instructions outlined in Section 2, Stacking the Trays.
2. Disconnect the 6" PVC pipe from the lid and blower. Visually inspect the interior for debris and clean as needed.
3. Disconnect the union for the influent water connection. If using a flow meter, you may want to clean it while it is off the system.
4. Remove the lid, then remove the mist eliminator from the lid. Clean the lid and mist eliminator with hot soap and water. Inspect the internal PVC plumbing for any obstructions.



Degreasers such as phosphate free detergent and Simple Green can also be used in breaking up hydrocarbon build up on the interior parts.

5. Remove the trays and bubble plates. Clean all parts using a brush with hot soap and water. Rinse thoroughly. As you remove and clean each tray and bubble plate, set them aside in a row for easier reassembly.
6. With the trays off the sump, it is recommended that the interior of the sump be inspected and accumulated debris removed. This will also prevent any clogging of the transfer pump.
7. Inspect the screen on the influent air intake shroud and remove any debris from the screen.

Mist Eliminator Maintenance

Clean the polypropylene mist eliminator on a regular basis. The required frequency of cleaning should be evaluated on a site by site basis, as frequency of cleaning is dependent on water chemistry and other factors. Figure 4-1 shows the location of the mist eliminator and retention hardware.

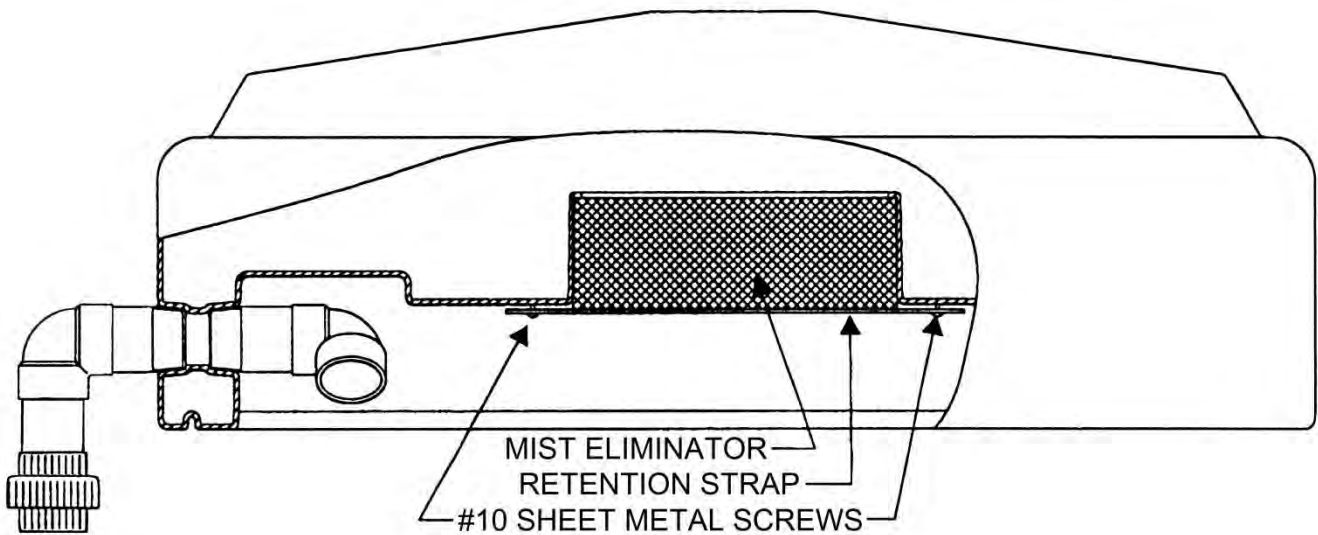


Figure 4-1 - The LO-PRO III mist eliminator.

1. Loosen the retaining clips and lift the entire lid assembly (cover) from the LO-PRO.
2. Remove the four (4) #10 sheet metal screws that secure the retention straps.
3. Pull the mist eliminator from the lid assembly.
4. Tap the demister against a sturdy surface to dislodge any large particles that are trapped within the mesh. When possible, completely soak the mesh and frame in a degreaser such as phosphate free detergent or Simple Green.
5. Rinse the mist eliminator with clean water and allow it to dry.
6. Replace the mist eliminator in the lid assembly and secure the retention straps with the screws.
7. Check and clean the influent water catch basin in the top tray.
8. Replace the lid assembly and tighten the retaining clips.

Reassembling the Trays and Lid



When reassembling the LO-PRO II, be sure the gaskets are clean and have no tears or gaps to eliminate any potential air leaks between trays.



Refer to the instructions outlined in Section 2, Stacking the Trays, in conjunction with this section when re-assembling the LO-PRO III Trays.

Trays and bubble plates (with downcomers) need to be restacked to the sump in the order they were removed. Orientation of the bubble plates is critical also in that the downcomers attached need to alternate from front to back. One downcomer (the one attached to the bubble plate for the sump) is taller than the rest and must go with the first bubble plate. Figure 4-2 shows the two kinds of downcomers used on the LO-PRO III system. See Section 8 for a listing of part numbers.

The rule of thumb is to know where to place the downcomer opening for the first bubble plate – either towards the front or to the back. This is determined as follows:

If the LO-PRO III has an even amount of trays (4, 6), place the first downcomer toward the front (or blower side) of the unit and to the right side of the sump (as shown in Figure 4-3). If the LO-PRO III has an odd amount of trays (3, 5, 7), place the first downcomer towards the back. Then alternate the bubble plate openings and downcomers front to back. When attaching the lid, there will be no downcomer below the water influent plumbing.



Never stack downcomers over one another. All bubble plates and downcomers are to alternate front to back, with the last bubble plate downcomer in back.

As you stack each tray, look at the alignment from all sides before completely latching the tray into place.

Finally, attach the lid. Verify that the mist eliminator is clean and securely strapped to the center hole inside the lid. Set the internal plumbing of the lid to a 45° angle, or towards the water catch basin within the top tray, then place the lid on, center it, and latch it into place.

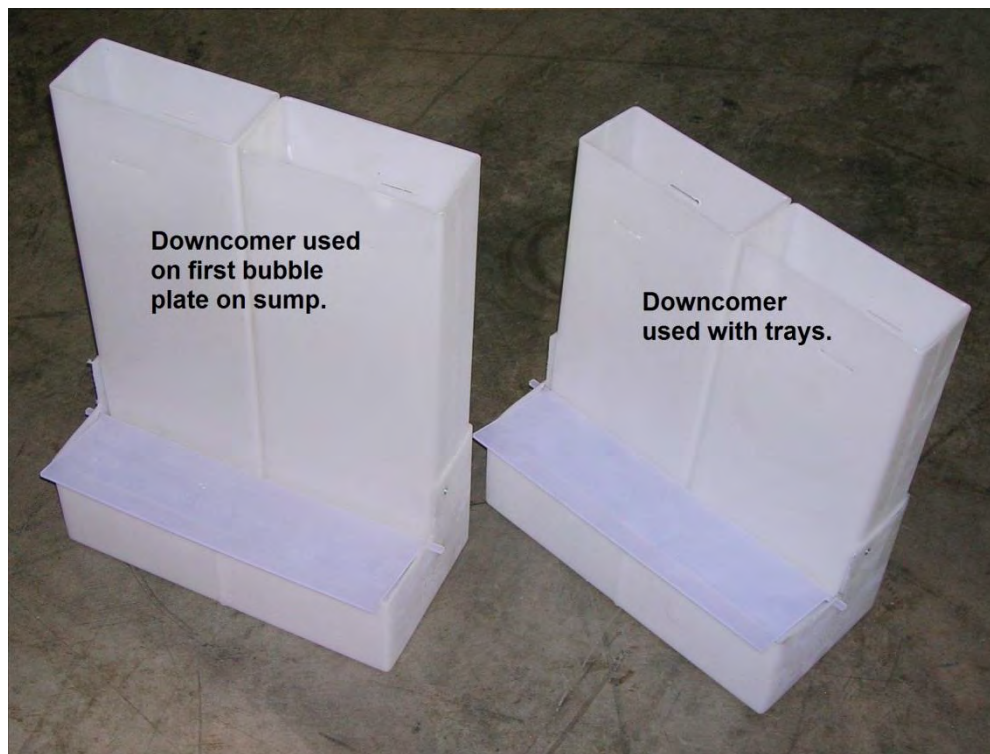


Figure 4-2 – LO-PRO III Downcomers



Figure 4-3 – First Bubble Plate on Sump

Clean Sump Probe

On a regular schedule, remove and wash the sump probe in phosphate free detergent and hot water. This will prevent fouling that could lead to failure of the probe. The required frequency of cleaning is dependent upon water chemistry, temperature and other factors that must be evaluated on a site by site basis.

Drain Vacuum (Pressure) Switches

The HI and LO Vacuum switches should be drained on a regular basis. This is particularly important in applications where excessive condensation may cause a buildup of moisture within the switch. To drain the switch, rotate the vent drain plug (underneath) one turn in a clockwise direction and then return the plug to its original position. See Figure 4-4.

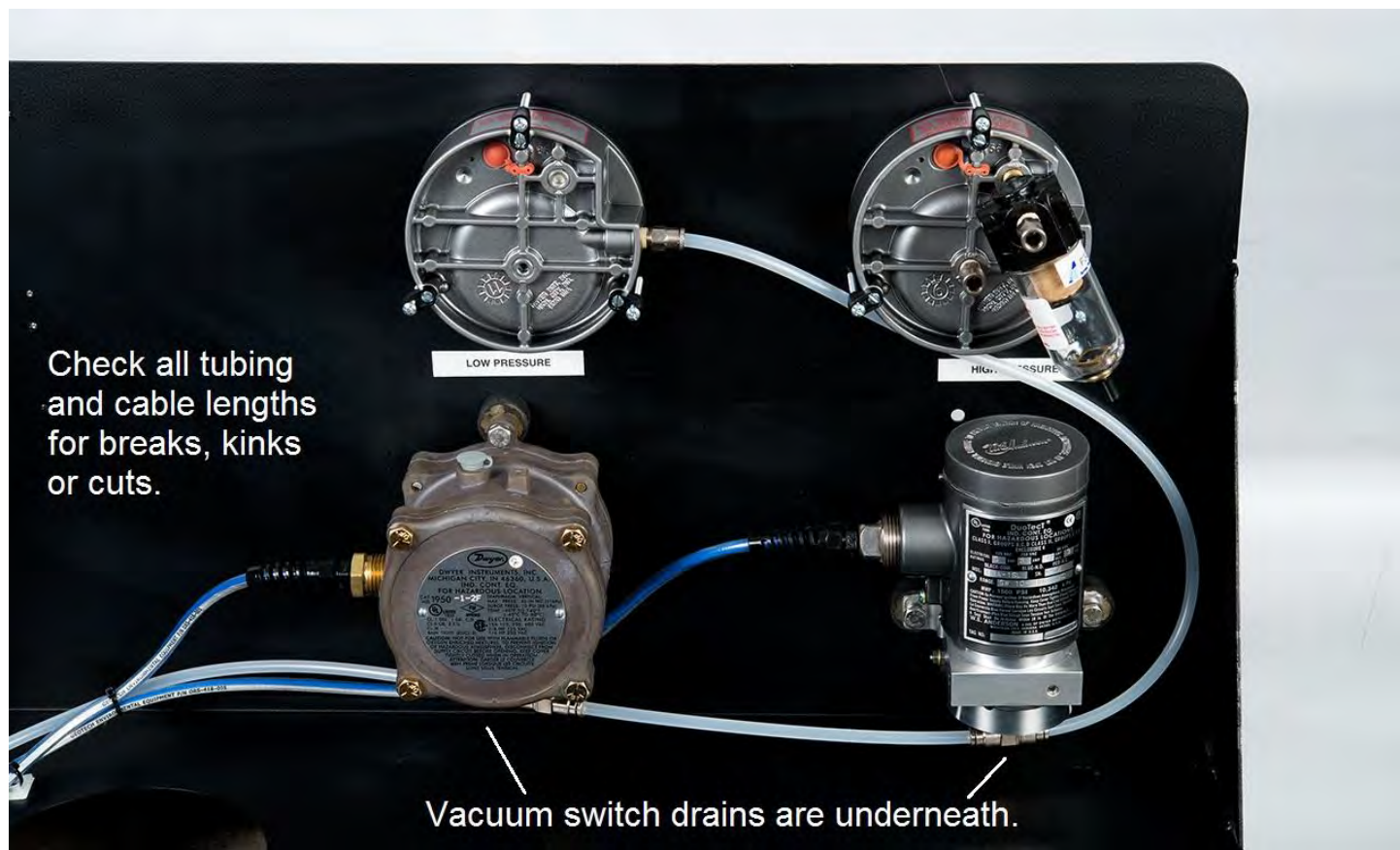


Figure 4-4 – Static Sensor Tubing between gauges and switches (CFM gauge tubing not shown)

Drain CFM Gauge Air Filter

The filter on the CFM gauge should be checked on a regular basis and drained if necessary. Drain the filter by turning the drain screw (underneath) in a clockwise direction (when viewed from the bottom of the filter.) Close the drain by turning the screw counter-clockwise. See Figure 4.4.

Check FEP Tubing

Regularly check the condition of the FEP tubing going from CFM gauge to Pitot tube and between the static pressure gauge, vacuum switches and static sensor tip in the influent piping. A cut, kink or loose tubing connection can cause operational problems with the LO-PRO III. See Figure 4-4.

Operation of the HI/LO Vacuum Switches

Though the HI and LO vacuum switches are called out as "pressure" switches, and can be used as such, their application with LO-PRO III systems are to be used as "vacuum" (negative pressure) switches. When you see the word "pressure", assume "vacuum" unless the step is defining a physical port on the switch itself, in which case the word "pressure" is used.

LO-PRO III "HI Vacuum" (pressure) switch

The HI vacuum switch used is always wired for "normally closed". The switch will remain closed until you adjust the vacuum setting screw to have the switch "open" at a specific vacuum (negative pressure) reading (in inches) on the Static Pressure gauge. This is achieved by turning the set screw clockwise (CW) for a higher setting, counter-clockwise (CCW) for a lower setting. When this setting is reached, the electrical contact will "open", breaking the circuit (and in most applications, shutting the system down).

LO-PRO III "LO Vacuum" (pressure) switch

The LO vacuum switch used is always wired for "normally open". Once a measureable amount of vacuum (1"/.3 kPa to 2"/.5 kPa or greater negative pressure) builds up within the unit, the switch will close and remain closed until you adjust the vacuum setting screw to have the switch "open" at a specific lower vacuum. This is achieved by turning the set screw CW for a higher setting, CCW for a lower setting. The GECM is preset to allow enough time for this switch to close as the unit is powered up. The electrical contact will "open" when the lower vacuum setting is reached, breaking the circuit.

- It's called a pressure switch, but it all depends on how you plumb it to the system. The "HIGH PRESSURE" port is used for positive pressure readings, the "LOW PRESSURE" port is used for vacuum (negative pressure) readings.
- All switches are wired to be physically "closed" without pressure (vacuum) applied, except for the low pressure switch (which is wired "normally open" and immediately closes with the first sign of vacuum (negative pressure).
- The blower is basically "sucking" air through the LO-PRO III system, thus the "vacuum" reference.

HI Vacuum Switch Setting

HI Vacuum switches are pre-set at the factory to not exceed 30" (7.5 kPa) Static Pressure on 10HP blowers or 35" (8.7 kPa) on 15HP blowers. The purpose of this setting is to maximize contact between the air and the contaminated water to be treated, as described in Section 1. Before proceeding with an adjustment, read the literature that came with the switch from the manufacturer.

When adjusting your HI Vacuum switch, use the following steps either to verify the current setting, or to make an adjustment to the HI Vacuum switch (such as after replacing a faulty switch):

1. Turn off the blower. Turn off the influent water to the lid.
2. Disconnect the 6" PVC influent pipe from the flexible coupling on the lid and tilt the pipe outward, clearing the coupling.
3. At the junction box remove the black and purple wires for the switch and attach an ohm meter to the ends of each wire. The ohm meter will show a "closed" circuit with the blower off.



If over-amping is a concern then it may be necessary to have an electrician open the blower motor electrical box and attach an amp probe to a power leg to verify that the name plate amps are not exceeded while adjusting the blast gate for 30" (7.5 kPa) or 35" (8.7 kPa).

4. Place a jumper on the circuit for the HI Vacuum switch at the junction box so that the GECM Control Panel (if supplied) will not turn the system off during the test.
5. Adjust the blast gate to half way, then turn on the blower.
6. Adjust the blast gate at open flow so that the amp reading is just one (1) value under the nameplate amps specified on the blower, then lock the blast gate in place. Proceed with one of the following options:

Option 1 - Verifying the current setting of an existing HI Vacuum switch

1. With the blower running, gradually cover the 6" inlet pipe with a hard flat object (not your hand) and monitor the increase in vacuum on the Static Pressure gauge. Keep an eye on the amp reading while doing so.
2. When the ohm meter shows "open" the inches shown on the gauge will be your current setting. If the ohm meter does not show an "open" after reaching the correct inch setting or upon reaching the name plate high amps, then the switch is either set too high or the switch is stuck (a stuck switch needs to be replaced.)
3. Adjust the switch by turning the Set Range screw on top CCW for less inches, CW for more inches.



Some LO-PRO III systems may not reach the maximum inch setting specified for the HP of the blower. If so, then set the switch for the highest setting you can get minus 2" (.5 kPa). For example, if the maximum reached is 27" (6.7 kPa), then set the HI Vacuum switch to open at 25" (6.2 kPa).

4. The switch will be set when the circuit "opens" at the correct inch setting (**without over amping the blower.**)
5. Turn the blower off and restore all electrical connections.

6. If you have a GECM Control Panel, turn the unit back on and cover the inlet pipe to verify that the GECM will turn off the system with the HI Vacuum setting (this will activate after 5 seconds.)
7. Re-connect the inlet pipe and restore the system for operation.

Option 2 - Adjusting the setting for a new HI Vacuum switch

1. Turn the set screw all the way CCW. The switch will show “closed” on the meter.
2. With the blower running, gradually cover the 6” inlet pipe with a hard flat object (not your hand) until the Static Pressure gauge reaches the desired inches you want to set it at **(do not let the amps exceed the blower specifications)**. With the switch all the way CCW, the meter should already show an “open” circuit.
3. Leave the cover in place on the inlet pipe. Using a flathead screwdriver, turn the set screw CW until the switch “closes”. This will “ball park” the adjustment. Turn the set screw back a few turns and continue to “fine-tune” the switch by removing and **slowly covering** the inlet pipe to verify the current setting. Repeat and adjust the set screw as necessary.
4. The switch will be set when the circuit “opens” at the correct inch setting **(without over amping the blower.)**
5. Turn the blower off and restore all electrical connections.
6. If you have a GECM Control Panel, turn the unit back on and cover the inlet pipe to verify that the GECM will turn off the system with the HI Vacuum setting (this will activate after 5 seconds.)
7. Re-connect the inlet pipe and restore the system for operation.

Fan/Motor Maintenance

Lubricate fan or motor bearings to the manufacturer’s recommendations. Lubrication recommendations are included with the packet attached to the fan. Should the packet be missing, the following will apply:

HP Range	Standard Duty 8 Hr./Day	Severe Duty 24 Hr./Day Dirty-Dusty	Extreme Duty Very Dirty High Ambients
10-40	3 Yrs.	1 Yr.	4 Mos.

Recommended motor greases:

Polyrex EM – Exxon Oil Co.

SRI #2 – Chevron Oil Co.

When greasing bearings, it is important not to over-grease. This is especially true if the bearings are not visible. In this case, more bearing failures occur due to over-greasing than under-greasing. It is best to give the bearing just one “shot” of grease (using the previous table) and while the system is warmed up and at a standstill.

Transfer Pump

If your system includes an optional transfer pump, the following routine maintenance tasks will help to ensure continuous service from the pump. Read the manufacturer supplied User Manual before proceeding.

- Check the flow rate weekly to ensure that the cycling frequency is minimized.
- Inspect hoses and wiring quarterly for cracks, cuts or abrasions.

Section 5: System Troubleshooting



These procedures are meant to be carried out by personnel qualified to work on electrical circuitry. If in doubt, obtain the services of a qualified electrician.

Getting Help

If the troubleshooting procedures in this section indicate a component failure, document the problem (as outlined below), then contact Geotech Sales for technical support.

Read the entire manual and become thoroughly familiar with all system components, system operation, and troubleshooting procedures. Prepare a written list of all problems encountered while operating the equipment.

Geotech service personnel are trained on all aspects of the LO-PRO III equipment line and are dedicated to helping you maximize the efficiency and cost effectiveness of your LO-PRO III system. Contact Geotech Sales for technical support of Geotech products.

Service Location

Geotech Service personnel are trained on all aspects of the LO-PRO equipment line and are dedicated to helping you maximize the efficiency and cost effectiveness of your LO-PRO system. For technical support of Geotech products contact us at the address listed below:

Geotech Environmental Equipment
2650 East 40th Avenue
Denver, CO 80205
Toll Free Phone: 800-833-7958
Commercial Phone: 303-320-4764
Fax: 303-320-7242

Troubleshooting Procedures

The troubleshooting procedures outlined in this section assume that your LO-PRO III is controlled by an optional GECM panel and is equipped with the optional sump probe, vacuum (pressure) switches and water flow gauge. Troubleshooting procedures for LO-PRO III systems without these optional controls are appended at the end of this section.



If the LO-PRO III is operated by a GECM Control Panel, then carefully read the troubleshooting section of the GECM User Manual before proceeding. Many of the display responses on the GECM front panel can easily be used to identify and isolate common problems.

The following troubleshooting guide contains potential problems with possible causes and recommended solutions. Before initiating troubleshooting, become familiar with proper installation and startup procedures as explained in Sections 2 and 3 of this manual.

Problem: Blower not running

1st Cause: Loss of power to the blower.

1. Check for status on GECM Control Panel. If blank, check fuses and wiring connections.
2. Check for tripped motor starter due to high amps.
3. Check for thermal overload on blower motor.

Solution:

1. Have qualified electrician inspect the electrical system. Verify amp settings on motor starter is correctly set for the blower motor specs.
2. If there is power to the system and the GECM Control Panel is not-functional, contact Geotech Sales for technical support.
3. Verify that blast gate has not opened all the way causing high amps.

2nd Cause: The HI Vacuum switch has shut down the blower for one of the following reasons:

1. Obstruction at the air intake portal.
2. Water build-up (entrainment) within the aeration trays.
3. Foaming in the trays or fouling of the bubble plates.
4. HI or LO Vacuum switch out of adjustment (read section on vacuum switches within Section 1).
5. Static sensor tubing line has been cut causing a LO Vacuum fault.

Solution:

1. Check for water discharge at the blower effluent. If water is found, skip to Step 2. If water is not found, check the HI Vacuum switch as follows:
 - a) Disconnect the 6" PVC blower influent pipe at the flexible coupling on the lid.'
 - b) Turn the blower control switch to OFF, press RESET, then turn the switch back to AUTO to restart the blower. With the blower running, gradually cover the 6" inlet pipe with a hard flat object (not your hand) and monitor the increase in vacuum on the Static Pressure gauge. Systems with a 10 HP blower should shut down at approximately 30" (7.5 kPa) water column (WC) or less while 15 HP blowers should shut down at approximately 35" (8.7 kPa) WC. If the blower fails to run or shuts off prematurely, refer to Section 4 and verify the adjustment of the HI Vacuum switch. If adjustment is not possible, the switch may be defective. Call Geotech Sales at 800-833-7958 or (303) 320-4764 for assistance.
2. If water is found in the blower piping, proceed as follows:
 - a) Confirm that the water flow rate is below 60 GPM (227 LPM). If the flow rate conforms to specification, check for a stuck float in the optional water flow gauge.
 - b) If the gauge is functioning properly and the flow rate is correctly set, remove the lid from the top of the tray stack and confirm that the water distribution nozzle is directed into the water catch basin.
 - c) If the nozzle is properly positioned, disassemble the tray stack and check for fouling of the bubble plates.
3. If the plates are fouled, clean according to the instructions outlined in Section 4 of this manual.

If the plates are not fouled, the water chemistry at your site may be causing foaming in the LO-PRO III. Call Geotech at 800-833-7958 or (303)320-4764 for assistance.



If the blower has taken on water, the Pitot tube and static tip must be cleaned before the system can be restarted. Remove the Pitot tube and static tip from the plumbing and use compressed air to blow any water from the tubes and air lines. Drain any liquid from the lines and vacuum switches.



Never blow compressed air directly into the gauges or vacuum switches as this may damage them.

Problem: Blower not running (system vacuum indicator showing).

Cause: The LO Vacuum switch has shut down the blower for one of the following reasons:

1. Incorrect motor rotation.
2. Obstruction at the blower effluent.
3. Severed FEP tubing or disconnected tubing at Static Sensor.

Solution:

1. Change the electrical leads on the motor to correct rotation.
2. Clear obstructions from discharge line.
3. Inspect FEP tubing for cuts or kinks.

Problem: Blower not running (thermal overload).

Cause: Shutdown caused by a blower thermal overload.

Thermal overloads are usually caused by exceeding the full load amps setting on the adjustable thermal overload circuit. Proceed as follows:



Shut down all 3-phase power before opening any enclosure. Follow proper lockout/tag out procedures.

Solution:

1. Confirm that the amp draw has not been exceeded. Refer to the blower motor nameplate for proper power supply requirements and adjust setting on the thermal overload circuit inside the motor starter enclosure.
2. Check for high ambient heat levels.
3. Check for minimum air flow requirement stamped on blower.



To restart the blower after thermal overload: Allow the motor to cool. Turn the blower control switch on the GECM Control Panel to OFF, press the REST button, then turn the switch back to AUTO.

Overheating can also be caused by an old or worn motor or insufficient cool air flow over the exterior of the motor.

Problem: Low removal efficiency.

Cause: Reduced contaminant removal efficiency can be caused by a number of factors, some of which are listed as follows:

1. Verify sizing program vs. actual influent contaminant levels.
2. Water flow rates are improperly adjusted.
3. Bubble plates fouled.
4. Tower out of plumb.
5. Low water temperature.
6. Foaming in trays.
7. Free or suspended product in influent water.
8. Clogged mist eliminator.

Solution:

1. Confirm water flow rate is below 60 GPM (227 LPM).
2. Confirm that the tray tower is plumb.
3. Clean mist eliminator using procedures outlined in Section 4.
4. Check for fouling of the bubble plates. Clean per procedure in Section 4.
5. Confirm that water temperatures have not deviated markedly from design parameters.
6. Check for water entrainment caused by foaming. If foaming is suspected, call Geotech for assistance.
7. At sites where contaminant is diesel or other heavy oil, check for presence of sheen in the LO-PRO III sump. If sheen is present, call Geotech for assistance.

Problem: Feed pump will not run.

Cause: The feed pump is controlled both by its own control circuitry and by input from the LO-PRO III sump probe.

The feed pump will not run unless:

1. Sufficient water is present in recovery well.
2. The LO-PRO III blower is running.
3. Power is present at feed pump control panel.

Solution: If these three prerequisites are met and the pump still will not run, proceed as follows:

1. Check the water level in the LO-PRO III sump. If the water level is high, determine why the sump is not draining. Look for a faulty transfer pump, a clogged sump discharge fitting or a fouled sump probe (HI-LO float stuck down). If the water level is not high, check for a fouled sump probe (HI-OVERRIDE float stuck up).
2. Check for a fouled feed pump probe or an electrical fault inside the feed pump control panel. Refer to the troubleshooting procedures provided with the feed pump.

Problem: Effluent pump will not run.

Cause: The effluent transfer pump is controlled by either a GECM Control Panel, its own control circuitry and by input from the LO-PRO III sump probe.

The effluent pump will not run unless:

1. Sufficient water is present in the sump.
2. Power is present at the effluent pump control panel.
3. Sump probe floats are not stuck.

Solution: If these prerequisites are met and the pump still will not run, check for a fouled sump probe or have a qualified electrician inspect the pump wiring and motor starter.

Problem: CFM Gauge Not Reading or Pegged Out.

Cause:

1. Tubing has been swapped or is cut or kinked.
2. Valve handle(s) on Pitot tube are closed.
3. Pitot tube has been turned in pipe.

Solution:

1. Replace bad tubing.
2. If gauge needle is all the way to the left or right, swap the tubing at the Pitot tube.
3. Ensure both valve levers on the Pitot tube are set to open.
4. Sensor holes on Pitot tube need to be in-line with the effluent air flow. Adjust Pitot tube as needed.

Additional Troubleshooting Procedures

The following procedures can be used to troubleshoot LO-PRO III systems that are not equipped with optional controls.



Exercise extreme caution when working with blowers and motor starters. Always follow all site lockout/tag out procedures.

Problem: Blower Not Running

Cause:

1. Tripped circuit breaker at service.
2. Blower shut down by thermal overload.

Solution:

1. Reset breaker and determine reason for excessive current draw (see below).
2. Determine cause of thermal overload by proceeding as follows:

Thermal overloads can result from bubble plate fouling or foaming in the trays. Fouling or foaming causes the blower to exceed its vacuum limits (30"/7.5 kPa to 35"/8.7 kPa of water) and eventually results in overheating and thermal overload shutdown. Thermal overloads can also be caused by high ambient temperatures around the blower.

Although most LO-PRO III blowers are not equipped with thermal overloads, heavy vacuum demands caused by bubble plate fouling or foaming will cause these blowers to heat up and draw excessive current. This will eventually cause the circuit breaker at the service or motor starter to blow.

Proceed as follows to eliminate the cause of the blower shutdown:

1. Disassemble the tray stack and check bubble plates for fouling. If the plates are fouled, clean as instructed in Section 4.
2. If the plates are not fouled, check for water buildup (entrainment) caused by foaming. To do this, turn off the influent water supply and remove the bottom of the effluent 6" pipe from the back of the blower. If water is found, chemicals at your site are causing foaming inside the LO-PRO III. Call Geotech for assistance.

Section 6: System Specifications

This page lists all the standard components and optional accessories included with your LO-PRO III Air Stripper. Geotech part numbers for the optional equipment listed can be found in Section 8.

Blower Model: _____

Blower horse power: 10 HP _____, 15 HP _____

GECM Control Panel (optional)* _____ (see specification sheet provided with GECM)

*When used with the GECM Control Panel, the LO-PRO III must be equipped with HI and LO Vacuum switches and a sump probe.

Optional Extras

_____ HI Vacuum Switch

_____ LO Vacuum Switch

_____ Sump Probe

_____ Transfer Pump

_____ CFM Gauge

_____ Junction Box

_____ Flow Meter

Dimensions

Length: 72" (183 cm)

Width: 60" (152 cm)

Number of trays: _____

Height: _____ (see Section 2)

Materials of Construction

Sump, trays and lid:

Linear Low Density Polyethylene

Bubble Plates:

Stainless Steel

Influent and effluent plumbing:

PVC

Performance

Water Flow Rate:

1-60 GPM (4-227 LPM)

Removal Efficiency:

Up to 99.99% for BTEX

Air Flow Rate:

Blower Efficiency Dependent

Blower

Type:

Centrifugal blower (TEFC: for use in Class 1, Div. 2 locations)

Flow Rate:

Up to 1100 CFM (31 CMM)

Voltage:

208-230/460

Phase:

3

HP:

10 – 15

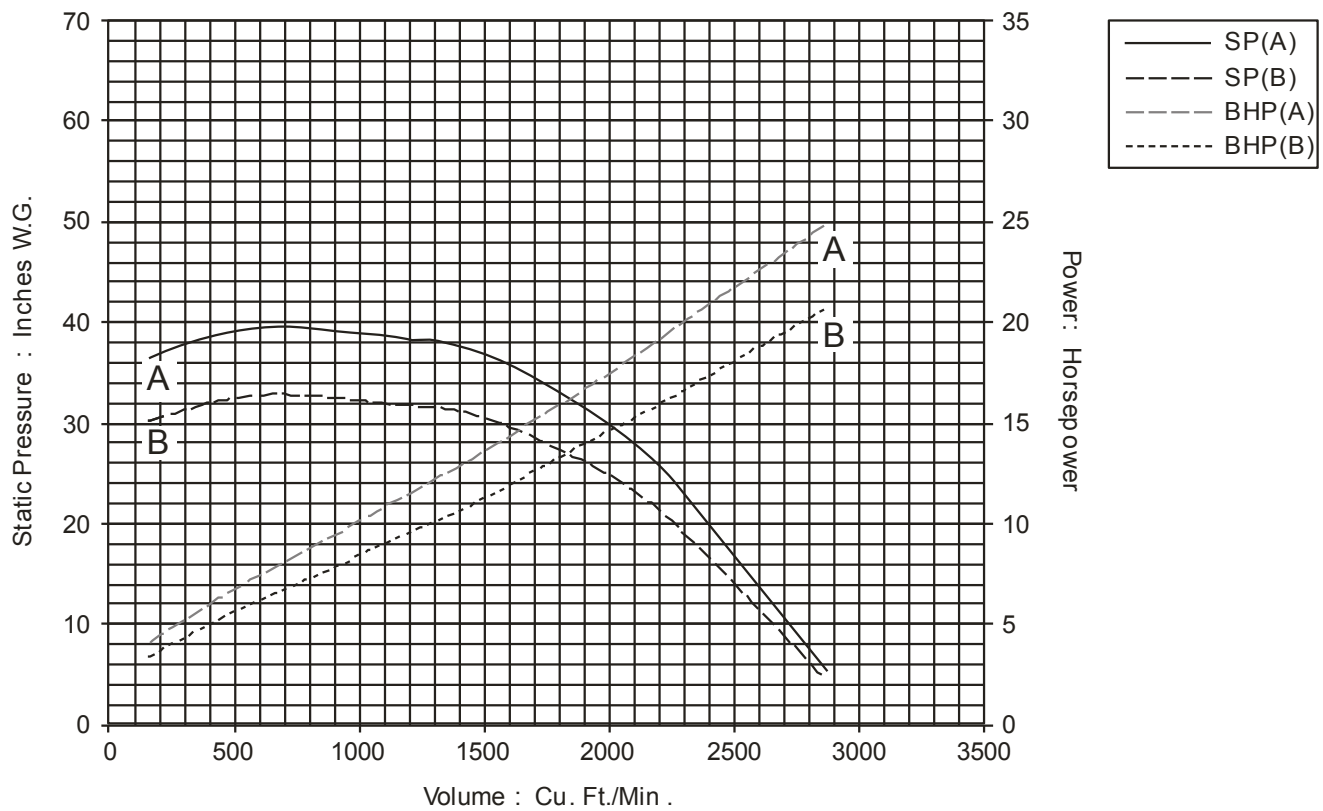
Environmental

Max Operating Temperature:

122F (50C)

PERFORMANCE DATA						
SCFM	SP	RPM	BHP	TEMP	ALT	DENSITY
800	38.5	3500		70	0	0.0750

MOTOR DATA						
HP	FRAM	RPM	VOLTS	PHASE	HZ	ENCL
10	215T	3500	208 OR 230/460	3	60	TEFC
10	215T	3500	208 OR 230/460	3	60	XPRF



A Size = VP-3-06-22.5A RPM = 3500 Density = 0.0750 lb./CF; Width = 100.00% SEA LEVEL

B Size = VP-3-06-22.5A RPM = 3500 Density = 0.0624 lb./CF; Width = 100.00% 5300 FEET

Figure 6-1 - LO-PRO III 10 HP Blower Performance Curve

LO-PRO III Wiring Diagrams

All LO-PRO III systems using a GECM Control Panel will have a GECM Field Wiring Diagram provided detailing all wire connections to the unit. This diagram can be updated or replaced as needed by Geotech.

Without the use of a GECM Control Panel, the on-site electrician will need to wire the blower motor to an appropriate motor starter and power service. The wiring from the LO-PRO III junction box (containing the wiring from the vacuum switches and sump probe) along with the motor thermals, must be integrated as a system shutdown component to the motor starter circuit in order to terminate power in the event of equipment failure.

Geotech can also build unit specific start boxes for use with the LO-PRO III, transfer pump, and accessories. Contact Geotech for more information on system requirements. Figure 6-1 contains basic wiring for a three phase blower (examples do not include junction box integration).

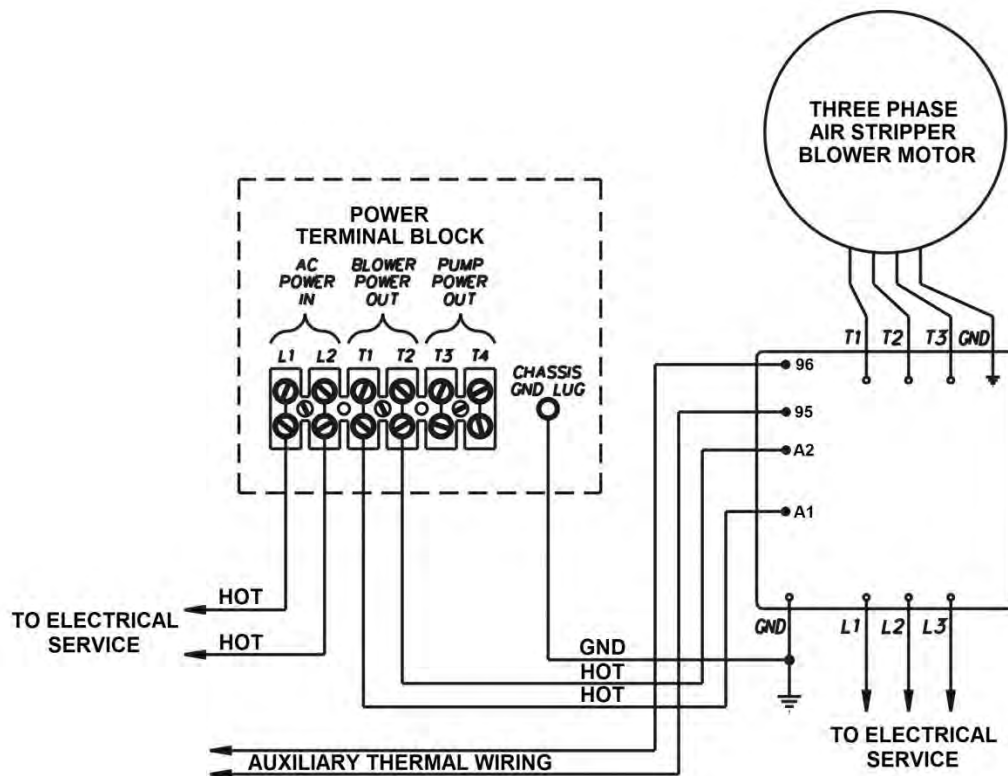


Figure 6-2 – Basic Three Phase Wiring Diagram

Section 7: System Schematic

System Configuration

Because the LO-PRO III is designed with the flexibility to cover a wide variety of applications, many different system configurations are possible. The System Specification sheet for your LO-PRO III can be found in Section 6. System dimensions and locations of influent/effluent water and air hookups are provided in Figures 1-2 and 2-1. Figure 7-1 contains the Process & Instrumentation Diagram for a standard LO-PRO III with optional controls.

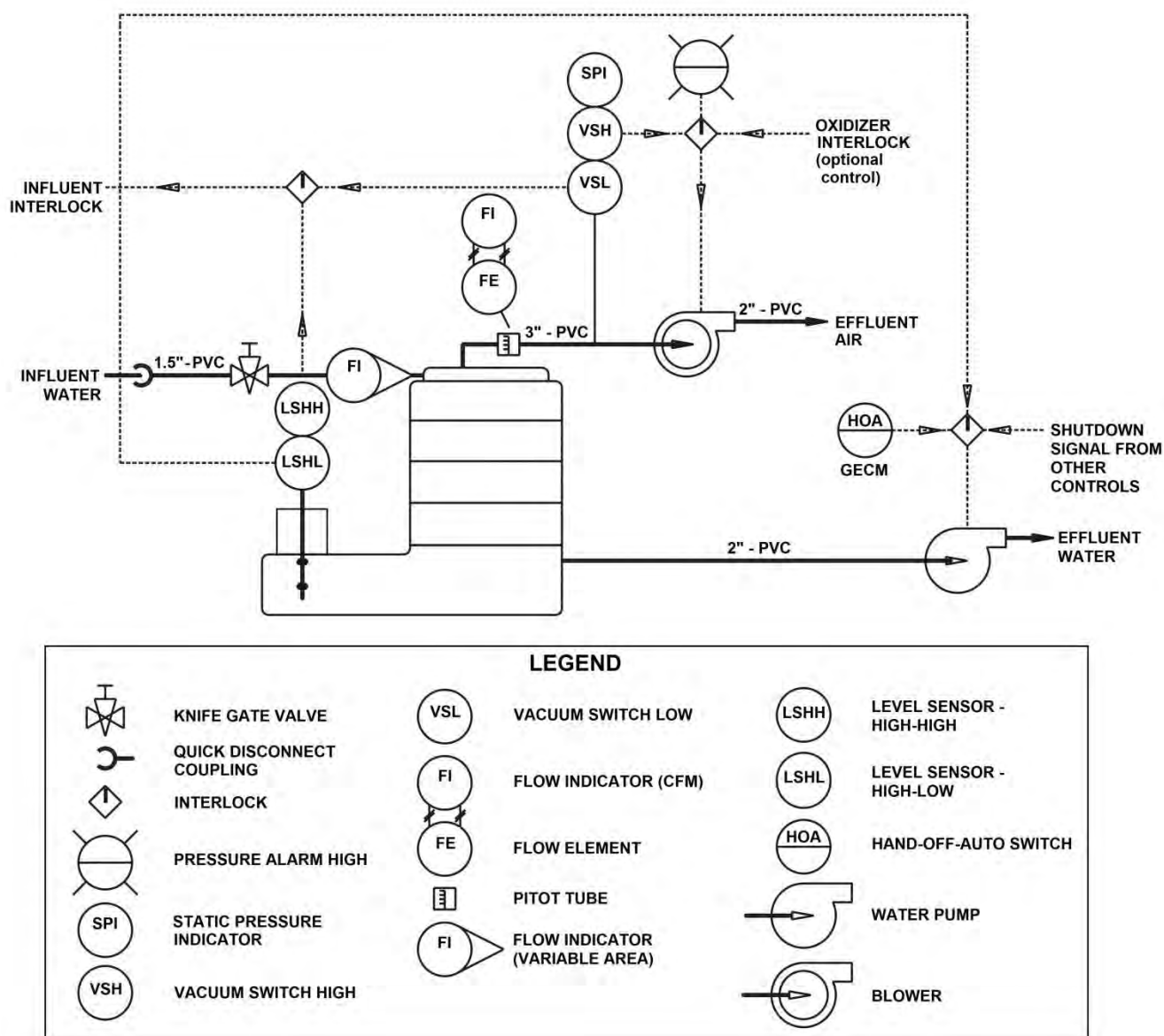


Figure 7-1 - The LO-PRO III Air Stripper P & ID showing optional controls and accessories.

Section 8: Replacement Parts and Accessories

Parts Description	Parts List
TANK,SUMP,72"x60"x16"HIGH	10263
TRAY,42"x60"x13"HIGH	10262
GASKET,LOPRO III TRAY,3 PIECE	PPM019008
BUBBLE PLATE,SS4,38.50x56.25	10284
DOWN COMER ASSY,SUMP LOPROIII	2450012
DOWN COMER ASSY,POLYPRO	2450000
PIN,STABLIZER,FOR LOPRO TRAY	10376
LID,42"x60"x15"HIGH	10261
MIST ELIM,12"x32"x4"THK	10872
STRAP,DEMISTER RETENTION	10695
ASSY,BASIN,TOP TRAY	2450005

Tray Assemblies

TRAY ASSY,13"HIGH,POLYPRO	2450003
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Control Panel and Instrumentation

PANEL,MOUNTING,LOPROIII,GAUGE	56140002
SWITCH,PRESS,SPDT,1.5-8 PSIG 1950P-8-2F	10745
SWITCH,PRESS,0.5-2.0PSI,EP	PPE080017
SWITCH,PRESS,0.4-1.6"WC	PPE080006
SWITCH,PRESSURE,DIFF,10-180"WC EXPL PROOF, H3 SER,H3A-1SL,DWY	16090265
LO PRESS. SHUT DOWN ASSY:	2100074
ASSY,SHUT DOWN,HIGH PRESSURE	2100075
GAUGE,VACUUM,0-50"WATER-0-12KP	PPP082023
SENSOR,STATIC TIP,W/HOSE	PPP099004
GAUGE,PRES,0-450CFM,0-12M3/MIN	16090010
GAUGE,FLOW,0-1000 CFM & M3/MIN	10715
FILTER,AIR,.175"NPT,20CFM	10315
SENSOR,FLOW,6",SST,PITOT	10631
ASSY,AIR FLOW SENSOR,6"PIPE	2460002

Air Line

TEE,1/8"NPTx1/4"TUBE	PPP105002
QCK CNCT,NCKL,1/4X1/8MPT,PUSH/ PULL	PPP103001
TUBING,FEP,.170x1/4,FT FEP	87050509

Blowers

BLOWER,10HP,TEFC,208/230/460/3 /60HERTZ 800 CFM @ 32" WATER	10871
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Transfer Pumps

PUMP,2HP,15GPM,150'HEAD	10451
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Accessories

JB,SITEPRO SGNL	2390065
CABLE,28AWG,8 COND,URETH	ORS418005
FERRULE WIRE,COPPER,26-22AWG 1 PACK OF 100	10032

FLOWMETER,6-60GPM,WATER	10653
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PROBE,DENS,SUMP	2450014
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ELBOW,PVC80,6",SxS	10592
PIPE,PVC80,6",GRAY,CLEAN, INDIVIDUALLY WRAPPED,NO PRINT	PPP035033
COUPLING,FLEXIBLE,6"x6"	10593
UNION,PVC80,2",SXS	PPP053004
PIPE,PVC80,2"	PPP035001

FRAME,BLOWER TO SUMP,PAINTED	10655
FRAME,BLOWER,VERTICLE,PAINTED	10627

SHROUD,AIR INTAKE,LP3	10611
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MANUAL,LO PRO III	10609
MANUAL,GECEM	16110163

Contact your Geotech Sales Representative for more information on GECEM Control Panels and other electrical features, including our variety of Water Table Depression Pumps, supporting the LO-PRO III System.

Appendix A: Decontamination Procedures

Some common decontamination solutions are listed below along with the contaminants they are effective against.

<u>Solution</u>	<u>Effective Against</u>
Water	Short-chain hydrocarbons, inorganic compounds, salts, some organic acids, other polar compounds.
Dilute Acids	Basic (caustic or alkaline) compounds, amines, hydrazines.
Dilute Bases	Acidic compounds, phenols thiols, some nitro- and sulfonic compounds.
Organic solvents	Non-polar compounds (such as some organic compounds)

The use of organic solvents is not recommended because:

- 1) organic solvents can permeate and/or degrade protective clothing and
- 2) they are generally toxic and may result in unnecessary employee exposure to hazardous chemicals.

When in doubt, use a dish washing liquid detergent. As a decontamination solution, it is readily available, is the safest of all the above, and is usually strong enough if used generously.

The use of steam can also be effective for decontamination. A water-lazer (pressurized water) is exceptionally valuable.

The following substances are noted for their particular efficiency in removing certain contaminants or for decontaminating certain types of equipment.

<u>Solution</u>	<u>Effective Against</u>
Penetone	PCB Contamination (since penetone may also remove paint, it is a good idea to spot-test before use)
Phosphate free detergent	Contaminated pumps
Ivory liquid	Oils
Diluted HTH	Cyanides
Radiac	Low level radioactivity
Isopropanol	Biological agents (should not be used on rubber products since it will break down rubber)
Hexane	Certain types of lab or sampling equipment (use of hexane is discouraged due to its flammability and toxicity)
Zep	General purpose cleaning
Phosphate free detergent	General purpose cleaning

Decontamination Solutions to Avoid

Some decontamination solutions should be avoided because of their toxicity, flammability, or harmful effects to the environment. Halogenated hydrocarbons, such as carbon tetrachloride, should not be used because of their toxicity, possible incompatibility, and some because of their flammability.

Organic decontamination solutions should not be used on personal protective equipment (PPE) because they may degrade the rubber or other materials comprising the PPE.

Mercurials are sometimes used for sterilization. They should be avoided because of their toxicity.

Chemical leaching, polymerization, and halogen stripping should all be avoided because of possible complications during decontamination.

Sand-blasting, a method of physical removal, should be avoided because the sand used on the contaminated object usually needs to be disposed of as hazardous waste, a very costly proposition. In addition, sand-blasting exposes personnel to silica, a carcinogen.

Freon is known to be particularly effective for the cleansing of PCB's but its effect on the ozone layer is extremely harmful. Its use is discouraged.

Strong acids or bases should not be used when cleaning metals and gaskets or tools or other equipment because of the possibility of corrosion.

Disposal of Decontamination Solutions and Waste Water

All solutions and water used for decontamination must be collected. If lab analysis indicates that the water and/or solutions exceed allowable contamination levels, they must be treated as hazardous waste. Alternatively, the solutions and water may be treated on-site to lower the contamination levels and render them non-hazardous.

Containers such as 55 gallon (208 liter) drums should be available for storage of wastes.

Spent decontamination solutions can be collected by using heavy-duty plastic sheets, visqueen sheets, kiddie pools, or if needed, a larger containment basin. The decontamination of equipment must be performed on the sheets or in the basins. They could be placed on a slight angle so that the spent decontamination solutions drain into a collection basin or drum.

Recommended Supplies for Decontamination of Personnel, Clothing and Equipment

The list below contains recommendations for supplies which would be on hand for the decontamination of personnel, clothing and equipment. Depending on the site activities, not all of these items may be needed. Alternatively, some additional items not listed here may be required.

- Drop cloths of plastic or other suitable material, such as visqueen, for heavily contaminated equipment.
- Disposal collection containers, such as drums or suitably lined trash cans for disposable clothing and heavily contaminated personal protective clothing or equipment to be discarded.

- Lined box with adsorbent for wiping or rinsing off gross contaminants and liquid contaminants.
- Wash tubs of sufficient size to enable workers to place booted foot in and wash off contaminants (without a drain or with a drain connected to a collection tank or appropriate treatment system).
- Rinse tubs of sufficient size to enable workers to place booted foot in and wash off contaminants (without a drain or with a drain connected to a collection tank or appropriate treatment system).
- Wash solutions selected to wash off and reduce the hazards associated with the contaminated wash and rinse solutions.
- Rinse solution (usually water) to remove contaminants and contaminated wash solutions.
- Long-handled, soft-bristled brushes to help wash and rinse off contaminants.
- Lockers and cabinets for storage of decontaminated clothing and equipment.
- Storage containers for contaminated wash and rinse solutions.
- Plastic sheeting, sealed pads with drains, or other appropriate method for containing and collecting contaminated wash and rinse water spilled during decontamination.
- Shower facilities for full body wash or at a minimum, personal wash sinks (with drains connected to a collection tank or appropriate treatment system).
- Soap or wash solution, wash cloths and towels.
- Clean clothing and personal item storage lockers and/or closets.

DOCUMENT REVISIONS		
EDCF#	DESCRIPTION	REV/DATE
-	Previous Release	01/09/2013
Project 1409	Edited images and spare parts to show new style shroud, edited tubing from poly to FEP, SP	10/30/2014

The Warranty

For a period of one (1) year from date of first sale, product is warranted to be free from defects in materials and workmanship. Geotech agrees to repair or replace, at Geotech's option, the portion proving defective, or at our option to refund the purchase price thereof. Geotech will have no warranty obligation if the product is subjected to abnormal operating conditions, accident, abuse, misuse, unauthorized modification, alteration, repair, or replacement of wear parts. User assumes all other risk, if any, including the risk of injury, loss, or damage, direct or consequential, arising out of the use, misuse, or inability to use this product. User agrees to use, maintain and install product in accordance with recommendations and instructions. User is responsible for transportation charges connected to the repair or replacement of product under this warranty.

Equipment Return Policy

A Return Material Authorization number (RMA #) is required prior to return of any equipment to our facilities, please call our 800 number for appropriate location. An RMA # will be issued upon receipt of your request to return equipment, which should include reasons for the return. Your return shipment to us must have this RMA # clearly marked on the outside of the package. Proof of date of purchase is required for processing of all warranty requests.

This policy applies to both equipment sales and repair orders.

FOR A RETURN MATERIAL AUTHORIZATION,
PLEASE CALL OUR SERVICE DEPARTMENT AT 1-800-833-7958

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Equipment Decontamination

Prior to return, all equipment must be thoroughly cleaned and decontaminated. Please make note on RMA form, the use of equipment, contaminants equipment was exposed to, and decontamination solutions/methods used.

Geotech reserves the right to refuse any equipment not properly decontaminated. Geotech may also choose to decontaminate equipment for a fee, which will be applied to the repair order invoice.

Geotech Environmental Equipment, Inc
2650 East 40th Avenue Denver, Colorado 80205
(303) 320-4764 • **(800) 833-7958** • FAX (303) 322-7242
email: sales@geotechenv.com website: www.geotechenv.com

Geotech

Project Information

Project Name: **ATI Acid Sump Project**
Project Number: **RC121115-01**
User Name: **Andrew Davidson- GSI Water Solutions**
Date printed: **12/11/2015**

Selection Criteria

Classification: **Unclassified**
Line Voltage: **208-230 volts, 3 Ph, 60Hz**
LoPro Type: **LoPro3**
Liquid flow rate: **30 gpm**
Min. Liquid temperature: **50 F**
Selection Method: **Manual**

Results

Blower type: **10HP American Fan**
Number of trays: **5**
Starting air flow: **1100.0 CFM**
Clean trays at: **720.0 CFM**
Starting air/water ratio: **274.2**

<u>Contaminant</u>	<u>Design Influent (ppb)</u>	<u>Effluent Target Conc (ppb)</u>	<u>Effluent After Single Pass (ppb)</u>	<u>Potential Excess ppb.</u>	<u>% Stripping Efficiency</u>
112 TRICHLOROETHANE	280000.0	200.0	486.0	286.0	99.83
11 DICHLOROETHANE	36000.0	50.0	2.2	0.0	99.99
12 DICHLOROETHANE	1000.0	5.0	1.6	0.0	99.84
CHLOROETHANE	13000.0	25.0	0.1	0.0	100.00
TRICHLOROETHYLENE	2000.0	5.0	0.0	0.0	100.00
CIS 12 DICHLOROETHYLENE	1000.0	70.0	0.6	0.0	99.94
TRANS 12 DICHLOROETHYLENE	1000.0	100.0	0.1	0.0	99.99
11 DICHLOROETHYLENE	20000.0	7.0	0.1	0.0	100.00
VINYL CHLORIDE	1000.0	2.0	0.0	0.0	100.00
TETRACHLOROETHYLENE	1000.0	5.0	0.0	0.0	100.00

*** Notice ***

This program assumes that the user has entered in the correct data. The selections made are to be used as a general guide only. The user is responsible for ensuring that the equipment is installed properly and in good operating condition.

Please contact Geotech Inc. @ 1-800-833-7958 for further assistance if necessary.
Copyright 1999 Geotech Inc.

PRODUCT DATA SHEET

April, 2008

**EZ CLEAN FIXED AXLE
OPEN ACCESS TANK**

(b) (4)

To the best of our knowledge the technical data contained herein are true and accurate at the date of issuance and are subject to change without prior notice. No guarantee of accuracy is given or implied because variations can and do exist. NO WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY BAKERCORP, EITHER EXPRESSED OR IMPLIED.

3020 OLD RANCH PARKWAY • SUITE 220 • SEAL BEACH, CA • 562-430-6262

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(b) (4)



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(b) (4)



(b) (4)



PRODUCT DATA SHEET*January, 2007***6500 GALLON POLY TANK
(Original Style and Total Drain)**

(b) (4)



To the best of our knowledge the technical data contained herein are true and accurate at the date of issuance and are subject to change without prior notice. No guarantee of accuracy is given or implied because variations can and do exist. NO WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY BAKERCORP, EITHER EXPRESSED OR IMPLIED.

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SEAL BEACH, CA 90740-2751

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Appendix D

ATI Emergency Action Plan, SI C-02




ATI Millersburg Operations and ATI Albany Operations - 34th Ave

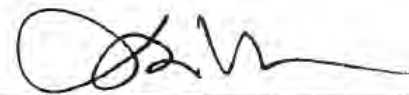
Safety Instruction #: SI C-02
Emergency Action Plan (EAP)
Revision: 11
Date: July 3, 2014

Initiated By:  4/17/14
Shawna Howard, Safety Engineer Date

Reviewed By:  6/16/14
Kevin Moran, USW Millersburg Ops Safety Coordinator Date

Reviewed By:  6/19/14
Josh Hall, USW Albany Ops – 34th Ave Safety Coordinator Date

Reviewed By:  6/16/14
Ryan Bodily, SA&C Safety & Health Manager Date

Approved By:  7/2/14
Lee Weber, VP of Operations Date

* Denotes change from previous revision.



I. **Scope**

This Emergency Action Plan (EAP) covers both the ATI Albany Operations – 34th Ave and ATI Millersburg Operations facilities. This plan defines actions that will be taken by all personnel (employees, contractors, visitors, etc.) before and during an emergency such as a fire, explosion, hazardous material release, security incident or natural disaster in an effort to minimize hazards to human health, the environment, property and equipment.

II. **Purpose**

This plan, when combined with the Emergency Response Plan (ERP), SI C-13, outlines how ATI Albany Operations – 34th Ave and ATI Millersburg Operations comply with the Environmental Protection Agency (EPA) regulations found in 40 CFR Part 265 and Occupational Safety and Health Administration (OSHA) regulations found in 29 CFR 1910.38, 1910.165, and 1910.120(q).

This EAP establishes the procedure for personnel to identify and report potential emergency situations and potential accidents that can have an impact on people, the environment, property and equipment. The ERP addresses how employees shall respond to emergency situations and accidents to prevent or mitigate associated adverse health, safety, environmental or business impacts.

Actions required by those who will respond to a potential or actual release of a hazardous material with the intention of containing, controlling or otherwise mitigating the release are provided in the ERP SI C-13.

III. **Responsibilities**

- a. All Employees, Contractors, Vendors, Visitors, etc.: Be aware of your surroundings and job responsibilities. Report actual or potential emergencies such as chemical releases, fires, security incidents or other emergency situations as explained in Section IV below. Be familiar with the alarm, assembly and evacuation procedures outlined in this plan.
- b. Department Managers: Ensure all Department employees are trained on the elements of this EAP and Department specific assembly areas, procedures and evacuation routes. Ensure all employees who may use an emergency escape respirator are trained following SI C-03. This training is typically done as part of a:
 - i. Monthly Safety Meeting and/or;
 - ii. Safe Job Introduction for New or Transferred Employees (SI S-06).
- c. Purchasing Plant Engineering: Ensure that all vendors, suppliers and contractors who have access to the plant receive training on this Emergency Action Plan.
- d. Visitor Escorts: Ensure visitor access is in compliance with Plant Entry Policies and escort visitor at all times so they act accordingly during an emergency.
- e. Supervisors or Appointed Designee: Take temporary control during an emergency in their department/area using the Supervisor Emergency Action Checklist (Appendix C) and provide assistance to the SERO upon arrival.
- f. Senior Emergency Response Official (SERO): Act in the role of an Emergency Coordinator, respond to emergencies and establish Command in accordance with the Incident Command System (ICS). Arrange for, and coordinate response activities with internal and external public and private agencies. Direct Spill Team activities for



hazardous material events. Plan and organize quarterly emergency response drills to practice this plan. Facilitate a critique after incidents and drills to provide feedback and revise procedures and plans as needed. Names, addresses, and telephone numbers (office and home) for each SERO are published in the ERP, SI C-13.

- g. Maintenance Department: In the event of a fire, some areas have local audible and visual alarms. At the ATI Millersburg Operations plant site, an alarm will sound in the Maintenance stockroom which notifies a Maintenance Supervisor to respond to the fire pumps and ensure they are operational.
- h. Safety Office: Arrange for the inspection and maintenance of Spill Team vans, the Spill Response Trailer and all emergency response center supplies to include:
 - Safety vest
 - Emergency radio
 - Extra AA batteries for the emergency radio
 - Check the operation of the emergency radio monthly and change batteries every 6 months.
 - Ensure this EAP is reviewed yearly and revised as needed.
- i. Environmental Department: Assist in emergency situations, accidents and remediation activities as needed to prevent or mitigate associated adverse environmental aspects. Environmental Department will maintain a spill pager team who will contact OERS, EPA, DEQ and/or the NRC as needed. This procedure is defined in Work Instruction WI-EMC-AII-1.

IV. Reporting Emergencies

When an emergency occurs, call Security immediately at Ext. 6334 (ATI Millersburg Operations) or Ext. 7911 (ATI Albany Operations – 34th Ave) and state the nature of the emergency. Also notify the Supervisor of the affected area.

Security follows emergency procedures including:

- i. Contacting outside emergency responders (911) for fire or medical emergency;
- ii. Contacting the on-duty SERO via telephone for plant emergencies (chemical upset, fires, natural disasters, etc.);
- iii. Contacting the on-duty in-plant medical responders for medical emergency (see SI M-07);
- iv. Following HR Policy #303 for bomb threats;
- v. Activating plant alarms:
 - 1. 1-1 “Take Cover” alarm for all security and domestic threats involving intruders or terrorist threats;
 - 2. 3-3 “Assemble” alarm for all chemical upsets, fires that involve more than one department or building, and earthquakes;
 - 3. Long Continuous Blast for Plant Evacuations after an “Assemble” alarm and completed headcount;
 - 4. 5-5 “All Clear” return to work;



Note: The SERO initiates evacuation orders and provides other specific information to the Designated Coordinators for employee action via the Radio Talker and Emergency Radios.

At ATI Albany Operations – 34th Ave switch your personal hand held radio to Channel 10. This is a receive only channel used during emergency situations.

V. Emergency Escape Routes

Escape route maps are posted throughout the facilities near telephones, and/or on employee bulletin boards, and/or near time clocks.

Escape route maps identify the nearest exits out of work areas, the designated assembly areas for the department and the nearest plant evacuation route.

All employees are responsible for the following:

- i. Knowing the location(s) of the nearest exit(s) and evacuation route(s) out of their work area(s);
- ii. Knowing the location(s) of the primary and alternate assembly area(s) designated for their work area(s).

VI. Emergency Alarms/Warnings

Notification to employees of the existence of an emergency and the need to assemble or evacuate occurs by one or more of the following mechanisms:

- i. The Plant Wide Emergency Alarm System;
- ii. A telephone activated building public address system;
- iii. Hand-held radios;
- iv. Sprinkler flow audible and visual (strobe) alarms;
- v. Smoke detector alarms;
- vi. Person to person contact if other methods are inadequate

See Section IV: Plant-Wide Emergency Alarm System explains the Plant-Wide Emergency Alarm signals.

All employees are responsible for knowing the sounds and/or lights of the alarm system(s) in their work area(s).

VII. Take Cover Procedure

Remain indoors or take cover in the nearest building. Close, lock and stay away from windows and doors if possible. Do not proceed to assembly area. Use emergency radios only if accessible without leaving the building. Radio Talker updates may not be made for this situation. Report any suspicious activity to Security at Ext. 6334 (ATI Millersburg Operations) or Ext. 7911 (ATI Albany Operations – 34th Ave).

*** VIII. Assembly and Evacuation Procedures**

Proceed to the designated department assembly area through the nearest exit. Select an assembly area upwind from any exposure. Go to the alternate assembly area if the primary assembly area is impacted. If not in your normal work area, go to the nearest assembly area and check in with the Designated Coordinator. If you are in your assigned assembly area check in with Designated Coordinator.



If possible, Supervisors are the last to leave the work area(s) and assure all personnel in their work area(s) have left prior to exiting the work area. Use Appendix D as an action check list. Do not park in the assembly area. Do not leave the designated assembly area until instructed to do so by the Designated Coordinator, "All Clear" signal or supervisor. If a plant evacuation is called, proceed on foot using the nearest evacuation route. Personal or company vehicles are not to be used for evacuation. Ensure all personnel at initial assembly area are accounted for at off-site assembly area after evacuation. Communicate with the Radio Talker after an evacuation for further instructions.

IX. Procedures Followed by Employees Who Remain to Operate Critical Plant Operations Before Evacuation or Assembly

Follow procedures for shutdown of critical equipment or processes. Only qualified operators, trained in the specific shut down procedures of critical equipment or processes, remain behind. Employees who shut down critical equipment or processes will only do so if the shutdown can be accomplished safely. Leave the area immediately if the critical equipment or process is involved in the emergency or is in the hazard area.

*** X. Procedures to Account for All Employees**

Each work area supervisor shall identify all individuals present in the assembly area for their work area as well as those employees involved in the shutdown of critical operations or processes and notify the Designated Coordinator of those accounted for. Designated Coordinators notify the Radio Talker of any missing or extra personnel via Emergency Radios when asked using appendix B as a check list and Appendix D as a communication guide.

XI. Natural Gas Interruptions

The main feed line distribution station is located at the ATI Albany Operations - 34th Ave facility 200 yards South East of Building #4, and is protected with locked security fencing. SERO's are the pipeline safety officers and oversee all emergency actions associated with the distribution station to include shutting down the main line.

The ATI Millersburg Operations has several isolation points to stop the flow of gas in an emergency. At both plants there are seismic shut-off valves located in various points in natural gas piping to stop the flow of gas in the event of an earthquake.

XII. Flood Plan

The ATI Albany Operations – 34th Ave and the majority of the ATI Millersburg Operations are located above the 100 year flood plain elevation. Those areas of ATI Millersburg Operations below this elevation, primarily the wastewater treatment facility, follow WI-EMO-21 in the event of a flood.

*** XIII. Earthquake Plan**

In the event of an earthquake, the above procedures will be followed for assembly and evacuation of the plant, if necessary. Hazardous material releases caused by such an event are handled in accordance with SI C-13. Natural gas leaks will be handled by isolating the flow of gas and fires will be addressed by the Albany Fire Department.

Following any significant earthquake, all buildings must undergo a thorough engineering review before they can be reoccupied. Also, all processes, piping, valves, tanks, etc. must be reviewed to ensure they are in proper operating condition before equipment and/or processes are restarted.



Note: A significant earthquake is defined as one with a minimum of a Mercalli Intensity of VII, which corresponds to an equivalent Richter magnitude of 6.0. These events have slight to moderate damage in well-built, ordinary structures. This will result in considerable damage to poorly built structures and some walls may fall. See Appendix E for USGS reference chart.

*** XIV. Inclement Weather**

During times of extreme weather or other hazardous conditions, directors will meet to discuss the forecast and/or current plant conditions. Once a risk reduction plan is formulated based on the situation, the V.P. of Operations will review and approve the plan prior to implementation.

If the event has been forecasted, the directors will meet ahead of time to confirm the following:

- Deicer is stocked and available in all departments throughout the plant. The Manager of Purchasing will ensure that additional inventory of deicer is maintained in the Receiving Warehouse starting November 1st of each year.
- Ice cleats are stocked in each deicer storage box.
- Contractors supporting the event have been informed of the pending situation by the Manager of Roads and Grounds, and have staged rock and equipment on the plant site as needed. Additional equipment anticipated has been rented. Priorities for road maintenance are communicated via plant drawing 21184 (ATI Millersburg Operations) and 109645 (ATI Albany Operations – 34th Ave).
- Employees have been informed of pending event (e-mail, reader boards) and requested to check the plant pre-recorded message at (541)926-4211, for updates and the current operating status of the plant.

During the event, the directors will meet to evaluate the current conditions and consider the following while developing a risk reduction plan:

- Can employees safely travel on outdoor walkways?
 - Potential Actions: Stay inside if possible; wear ice cleats if critical work outside is required; contract roads and walkways to be cleared; apply deicer
- Can IME be operated outside in a safe manner?
 - Potential Actions: Limit IME use outside to only critical tasks; contract roads and walkways to be cleared, apply deicer
- Did enough staff report to work to safely continue operating production equipment?
 - Potential Actions: Shutdown non-critical operations
- Do conditions dictate a full or partial day closure?
 - Potential Actions: Do not count absence as unapproved; allow LWOP or vacation; follow company HR Policy 415 detailing extreme weather conditions and absence information.
- What department or specific equipment needs to continue to run to minimize potential damage?
 - Potential Action: Staff critical departments or equipment areas



- What notifications need to be made to employees?
 - Potential Action: Update plant recording; follow company HR Policy 415 detailing extreme weather conditions and absence information

XV. Power Outage Plan

In the event of a plant wide power outage, it is up to each department to determine if employee assembly is necessary to ensure safety. Each employee should remain in their area unless directed otherwise. Landline and cell phone communication may be interrupted and Security will need to be contacted in person or by 2-way radio.

XVI. Rescue & Medical Duties for Responding Employees

Do not attempt any rescue unless properly trained, equipped and not placed in danger. Those who are trained medical responders (available 24x7) render first aid/medical care within their capabilities and training. The on-duty medical responder determines transportation of the ill and injured. The Albany Fire Department is used for critical injuries and for advanced life support and transportation during hazardous material emergency responses.

XVII. Review Process

The Safety Office monitors, reviews and updates this EAP when any of the following occur:

1. There is a revision or introduction of new applicable regulations
2. The plan fails in an exercise or real emergency
3. Changes to the configuration of the emergency response area
4. Introduction of new hazards into the emergency response area



*

Appendix A: Designated Coordinators and Assembly Areas

Designated Coordinators are responsible for the following:

ATI Millersburg Operations:

- Knowing the Emergency Evacuation Routes and Assembly Areas (AA);
- Designating an alternate coordinator during absences from the facility, including nights and weekends;
- Completing the Assembly and Headcount Checklist in Appendix B. The alternate coordinator or individual assigned by the supervisor completes the form in primary Designated Coordinator's absence;
- Maintaining the Department or Area Specific Emergency Action Plan binder which includes;
 - Designated Coordinators and Assembly Area List;
 - Procedure designating alternate coordinator(s)
 - For areas that are not manned 24/7, specify an alternate assembly area for off shift assemblies and communicate to the effected employees;
 - Posting of Evacuation Route Maps.

ATI Albany Operations – 34th Ave:

- Knowing the Emergency Evacuation Routes and Assembly Areas (AA);
- Completing the Assembly and Headcount Checklist in Appendix B.
- Maintaining the Emergency Action Plan binder.

**Please refer to the Safety SharePoint site for a list of
Assembly Area Designated Coordinators**

ATI Millersburg Operations Off-Site Assembly Areas

Plant Assembly Area	Location
1	Fitness Center
2	Willamette Memorial Park Cemetery
3	Willamette River

ATI Albany Operations – 34th Ave Off-Site Assembly Areas

Plant Assembly Area	Location
Primary	YMCA
Secondary	Circle K



Appendix B:

Assembly and Headcount Checklist

Assembly Area # _____

- ☐ Proceed to the Assembly Area.
- ☐ Obtain Emergency Radio, this Checklist, and put on the orange safety vest.
- ☐ Establish control of employees at the assembly area.
- ☐ Account for missing or additional personnel as checked in and notified by area Supervisor or designated employee.
- ☐ Monitor the Emergency Radio for further instructions or information.
- ☐ Area(s) involved in the Emergency notifies the SERO (Radio Talker) of missing personnel via the Emergency Radio when directed, (See Appendix D for radio communication guidelines)
- ☐ All area(s) notify the SERO (Radio Talker) of missing personnel that may possibly be in the affected area, when directed.
- ☐ When directed, all area(s) notify the SERO (Radio Talker) of Extra Personnel.
- ☐ Communicate relevant information to personnel assembled.
- ☐ Terminate assembly when instructed by the SERO or upon hearing an All Clear Signal (5-5).

Missing Personnel

Extra Personnel

Completed by _____

Date _____

Send this completed form to the Safety Office.



Appendix C: Supervisor's Emergency Action Check List

Life Safety

Assess the Situation and Secure Area	
	Call Security at x6334 (Millersburg) or x7911 (34 th Avenue) - Determine if plant alarm is to be sounded
	Evacuate the affected area/department
	Assign head count responsibility
	Determine hazards (real or potential)
	Tape/rope off the affected area
	Prevent re-entry of personnel into hazard area
Protect Yourself	
Size Up Potential Hazards	

Duty Check List

	Don Safety Vest
	Assign an employee to guide Emergency Vehicles
	For Fires - Ensure Sprinkler Control Valves are open and remain open until directed by a SERO to close
	Communicate hazard information to the Fire Department
	Maintain record of activities
	Continue to evaluate potential hazards
	Notify the designated coordinator that your crew is accounted for and note any missing or additional employees.
	Turnover checklist and other collected data to SERO when on station

Environment

Environmental Conservation	
	Block storm drains - notify Environmental if material enters any drains x7140 *
	Isolate Hazardous Materials
	Stop / prevent incoming material / product movement into area

Equipment/Building

Control of Energy	
	Mechanical - can equipment be shutdown?
	Electrical - can electricity be shut off?
	Fuels (Gasoline, Natural Gas, H2 etc.) Can fuel sources be shut off?
	Compressed Air
	Removal of exposed material such as compressed gas, drums, etc.
	Chemicals (CL2, acids, etc.) Can chemical lines be secured?
	Has anything been brought into the area that must be removed?

Product

Product	
	Remove or protect product only if it is safe to do so

Record Time:

Activity / Action



Appendix D: Emergency Radio Communication Guidelines

1. Emergency Radios are for communicating information concerning the emergency and Emergency Assembly only.
2. Before talking, listen and take care not to “over talk” other communications.
3. During assemblies the SERO will appoint a Radio Talker. Once the Radio Talker is established, all communication will be directed to the Radio Talker. The Radio Talker will announce him/herself when established.
4. Provide the relevant information to the Radio Talker when directed.
5. The following format will be used when calling the Emergency Radio:

Who you are calling, “This is”, Who you are, Your Message, “OVER”

Example: Radio Talker, This is Assembly Area #1 Receiving Warehouse, I have John Doe missing possibly in the affected area, Over

6. The following format will be used when answering a call on the Emergency Radio:

Who called, “This is”, Who you are, Your Answer, “OVER”

Example: Assembly Area #1 Receiving Warehouse, This is the Radio Talker, Acknowledge that John Doe is missing possibly in the affected area, Over



* **Appendix E:**
Modified Mercalli Intensity Scale

Mercalli Intensity	Equivalent Richter Magnitude	Witness Observations
I	1.0 to 2.0	Felt by very few people; barely noticeable.
II	2.0 to 3.0	Felt by a few people, especially on upper floors.
III	3.0 to 4.0	Noticeable indoors, especially on upperfloors, but may not be recognized as an earthquake.
IV	4.0	Felt by many indoors, few outdoors. May feel like heavy truck passing by.
V	4.0 to 5.0	Felt by almost everyone, some people awakened. Small objects moved. trees and poles may shake.
VI	5.0 to 6.0	Felt by everyone. Difficult to stand. Some heavy furniture moved, some plaster falls. Chimneys may be slightly damaged.
VII	6.0	Slight to moderate damage in well built, ordinary structures. Considerable damage to poorly built structures. Some walls may fall.
VIII	6.0 to 7.0	Little damage in specially built structures. Considerable damage to ordinary buildings, severe damage to poorly built structures. Some walls collapse.
IX	7.0	Considerable damage to specially built structures, buildings shifted off foundations. Ground cracked noticeably. Wholesale destruction. Landslides.
X	7.0 to 8.0	Most masonry and frame structures and their foundations destroyed. Ground badly cracked. Landslides. Wholesale destruction.
XI	8.0	Total damage. Few, if any, structures standing. Bridges destroyed. Wide cracks in ground. Waves seen on ground.
XII	8.0 or greater	Total damage. Waves seen on ground. Objects thrown up into air.

Taken from USGS Website